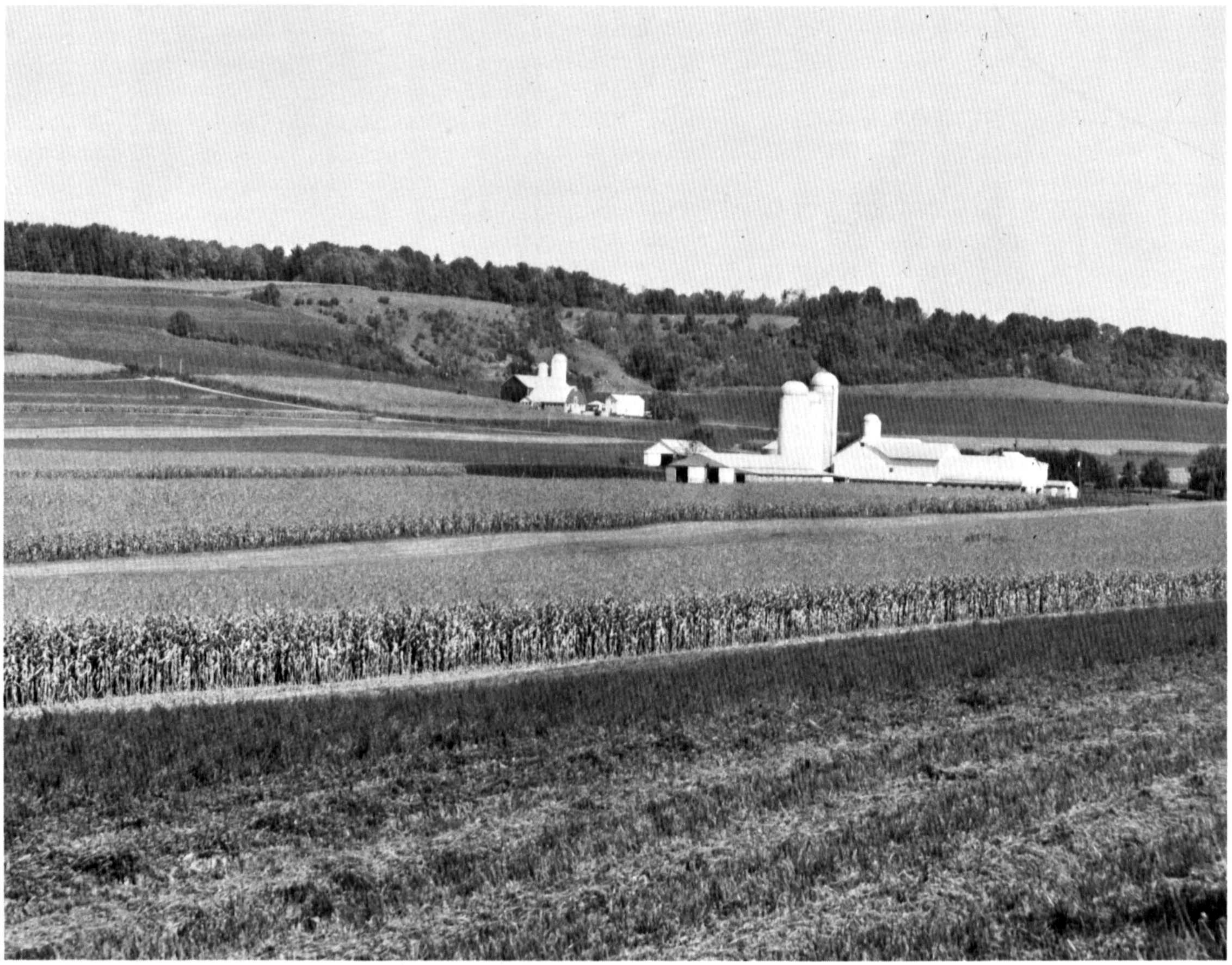
SOIL SURVEY OF

Juniata and Mifflin Counties Pennsylvania

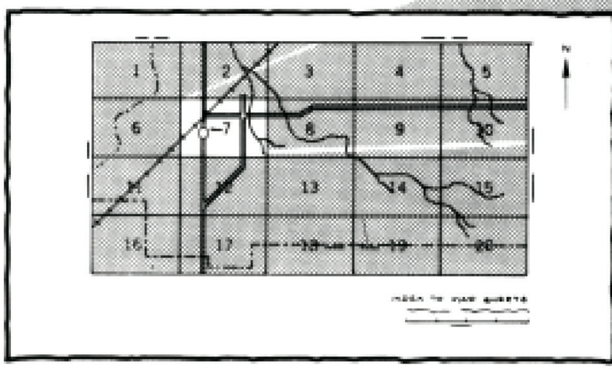


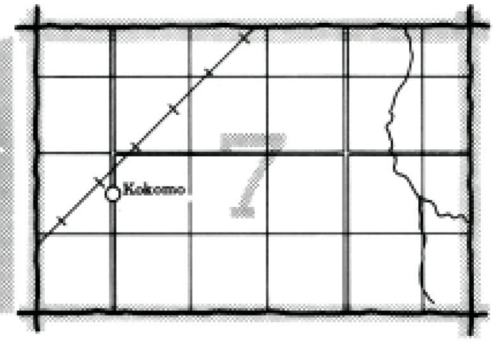
United States Department of Agriculture
Soil Conservation Service

In cooperation with the
Pennsylvania State University
College of Agriculture and the
Pennsylvania Department of Environmental Resources
State Conservation Commission

HOW TO USE

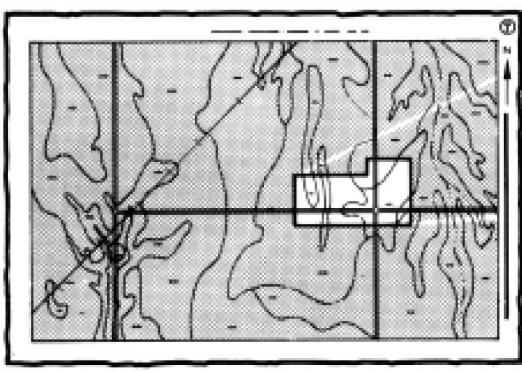
1. Locate your area of interest on the "Index to Map Sheets"

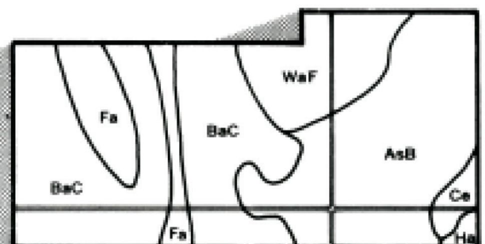




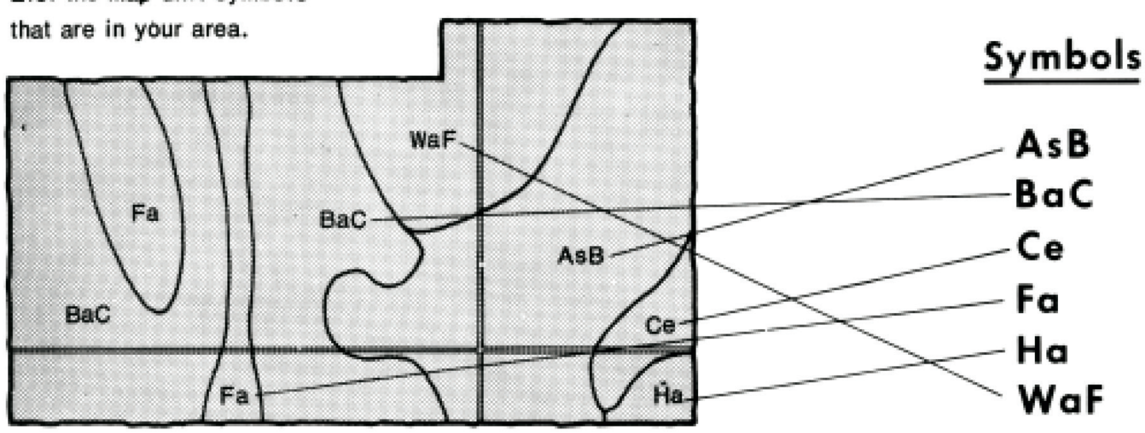
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



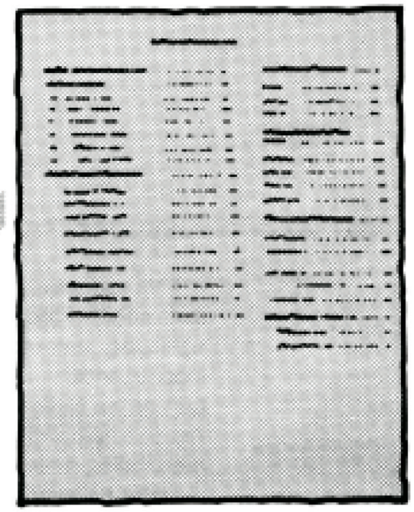


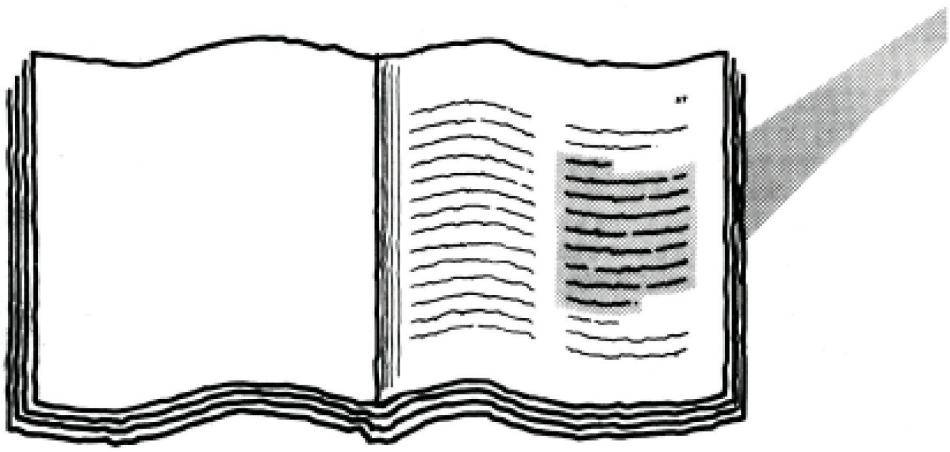
4. List the map unit symbols that are in your area.



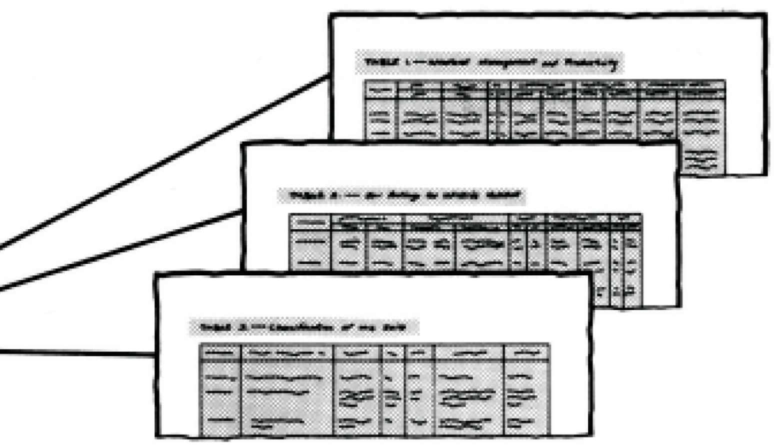
THIS SOIL SURVEY

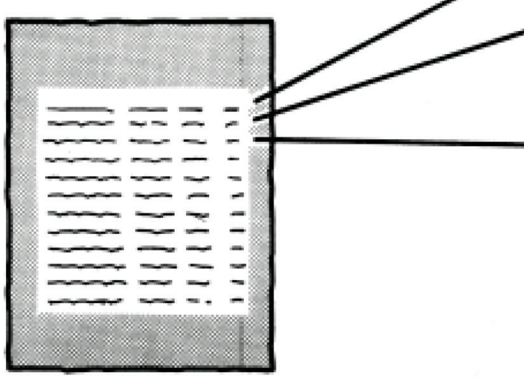
5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.





7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1967-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service; The Pennsylvania State University College of Agriculture; and the Pennsylvania Department of Environmental Resources, State Conservation Commission. Financial assistance was provided by the Juniata County Commissioners and the Mifflin County Commissioners.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Typical rural area in Juniata and Mifflin Counties. Mertz cherty silt loam, 3 to 8 percent slopes, is in the foreground; Nolin silt loam is in the middle; and Opequon silty clay loam, 8 to 15 percent slopes, is on the ridge in the background.

Contents

	Page
Index to soil map units	iv
Summary of tables	vi
Foreword	ix
General nature of the area	1
Climate	1
Geology	2
Water	2
Farming	2
How this survey was made	3
Soil map for general planning	3
Descriptions and potentials of soil associations	3
1. Hazleton-Laidig-Buchanan association	3
2. Berks-Weikert association	4
3. Hagerstown-Opequon-Murrill association	4
4. Edom-Klinesville-Weikert association	4
5. Mertz-Elliber-Kreamer association	5
6. Atkins-Monongahela-Allegheny association	5
7. Morrison association	5
Broad land use considerations	5
Soil maps for detailed planning	6
Soil descriptions and potentials	7
Planning the use and management of the soils	51
Crops and pasture	51
Yields per acre	53
Capability classes and subclasses	53
Woodland management and productivity	54
Engineering	55
Building site development	56
Sanitary facilities	56
Construction materials	57
Water management	58
Recreation	58
Wildlife habitat	59
Soil properties	60
Engineering properties	61
Physical and chemical properties	61
Soil and water features	62
Laboratory soil characterization	63
Classification of the soils	65
Soil series and morphology	65
Allegheny series	65
Allenwood series	65
Alvira series	66
Andover series	66
Ashton series	66
Atkins series	67
Berks series	67
Brinkerton series	67
Buchanan series	68
Chavies series	68
Dekalb series	69
Edom series	69
Elliber series	70
Ernest series	70
Evendale series	70
Hagerstown series	71
Hazleton series	71
Klinesville series	72
Kreamer series	72
Laidig series	73
Leetonia series	73
Melvin series	74
Mertz series	74
Millheim series	74
Monongahela series	75
Morrison series	75
Murrill series	76
Newark series	76
Nolin series	76
Opequon series	77
Penlaw series	77
Philo series	77
Pope series	78
Purdy series	78
Tyler series	78
Vanderlip series	79
Watson series	79
Weikert series	80
Classification	80
Formation of the soils	80
Factors of soil formation	81
Parent material	81
Climate	81
Topography	81
Plant and animal life	81
Time	81
Processes of soil formation	82
Major soil horizons	82
References	82
Glossary	83
Illustrations	87
Tables	101

Issued ....

Issued April 1981

Index to Soil Map Units

	Page
AbB—Allegheny loam, 2 to 8 percent slopes	7
AdB—Allenwood gravelly silt loam, 2 to 8 percent slopes	7
AdC—Allenwood gravelly silt loam, 8 to 15 percent slopes	8
AdD—Allenwood gravelly silt loam, 15 to 25 percent slopes	8
AlB—Alvira silt loam, 2 to 8 percent slopes	9
AnB—Andover gravelly loam, 2 to 8 percent slopes	9
AoB—Andover extremely stony loam, 0 to 8 percent slopes	10
AoC—Andover extremely stony loam, 8 to 15 percent slopes	10
As—Ashton silt loam	10
At—Atkins silt loam	11
BkB—Berks shaly silt loam, 2 to 8 percent slopes	11
BkC—Berks shaly silt loam, 8 to 15 percent slopes	12
BlD—Berks-Weikert shaly silt loams, 15 to 25 percent slopes	12
BMF—Berks-Weikert association, steep	13
BrA—Brinkerton silt loam, 0 to 3 percent slopes	13
BrB—Brinkerton silt loam, 3 to 8 percent slopes	14
BuB—Buchanan gravelly loam, 3 to 8 percent slopes	14
BuC—Buchanan gravelly loam, 8 to 15 percent slopes	15
BxB—Buchanan extremely stony loam, 3 to 8 percent slopes	15
BxD—Buchanan extremely stony loam, 8 to 15 percent slopes	16
CaB—Chavies loam, 2 to 8 percent slopes	16
EdB—Edom silty clay loam, 3 to 8 percent slopes	17
EdC—Edom silty clay loam, 8 to 15 percent slopes	17
EdD—Edom silty clay loam, 15 to 25 percent slopes	18
EeB—Edom-Klinesville complex, 3 to 8 percent slopes	18
EeC—Edom-Klinesville complex, 8 to 15 percent slopes	19
EeD—Edom-Klinesville complex, 15 to 25 percent slopes	19
EfB—Edom-Weikert complex, 3 to 8 percent slopes	20
EfC—Edom-Weikert complex, 8 to 15 percent slopes	21
EfD—Edom-Weikert complex, 15 to 25 percent slopes	21
ElB—Elliber very cherty loam, 3 to 8 percent slopes	22
ElC—Elliber very cherty loam, 8 to 15 percent slopes	22
ElD—Elliber very cherty loam, 15 to 25 percent slopes	23
ElF—Elliber very cherty loam, 25 to 60 percent slopes	23
ErB—Ernest silt loam, 2 to 8 percent slopes	23
ErC—Ernest silt loam, 8 to 15 percent slopes	24
Ev—Evendale cherty silt loam	25
HaB—Hagerstown silt loam, 2 to 8 percent slopes	25
HcB—Hagerstown silty clay loam, 3 to 8 percent slopes	25
HcC—Hagerstown silty clay loam, 8 to 15 percent slopes	26
HcD—Hagerstown silty clay loam, 15 to 25 percent slopes	26
HeB—Hagerstown-Rock outcrop complex, 0 to 8 percent slopes	27
HeD—Hagerstown-Rock outcrop complex, 8 to 25 percent slopes	27
HhB—Hazleton channery loam, 3 to 8 percent slopes	28
HhC—Hazleton channery loam, 8 to 15 percent slopes	28
HhD—Hazleton channery loam, 15 to 25 percent slopes	29
HSB—Hazleton-Dekalb extremely stony sandy loams, gently sloping	29
HSD—Hazleton-Dekalb extremely stony sandy loams, moderately steep	30
HTF—Hazleton-Dekalb association, steep	30
KlB—Klinesville shaly silt loam, 3 to 8 percent slopes	31
KlC—Klinesville shaly silt loam, 8 to 15 percent slopes	31
KlD—Klinesville shaly silt loam, 15 to 25 percent slopes	32
KlF—Klinesville shaly silt loam, 25 to 50 percent slopes	32
KrB—Kreamer cherty silt loam, 2 to 8 percent slopes	32
KrC—Kreamer cherty silt loam, 8 to 15 percent slopes	33
LaB—Laidig channery loam, 3 to 8 percent slopes	33
LaC—Laidig channery loam, 8 to 15 percent slopes	34
LaD—Laidig channery loam, 15 to 25 percent slopes	34
LcB—Laidig extremely stony loam, 3 to 8 percent slopes	35
LcD—Laidig extremely stony loam, 8 to 25 percent slopes	35
LDF—Laidig extremely stony loam, steep	36
LtB—Leetonia extremely stony loamy sand, 0 to 12 percent slopes	36
Ma—Melvin silt loam	36
MeB—Mertz cherty silt loam, 3 to 8 percent slopes	37
MeC—Mertz cherty silt loam, 8 to 15 percent slopes	37
MeD—Mertz cherty silt loam, 15 to 25 percent slopes	38
MnB—Millheim silt loam, 3 to 8 percent slopes	38

Index to Soil Map Units—continued

	Page
MnC—Millheim silt loam, 8 to 15 percent slopes	39
MoA—Monongahela silt loam, 0 to 3 percent slopes	39
MoB—Monongahela silt loam, 3 to 8 percent slopes	40
MrB—Morrison gravelly sandy loam, 3 to 8 percent slopes	40
MrC—Morrison gravelly sandy loam, 8 to 15 percent slopes	41
MrD—Morrison gravelly sandy loam, 15 to 25 percent slopes	41
MuB—Murrill gravelly loam, 3 to 8 percent slopes	41
MuC—Murrill gravelly loam, 8 to 15 percent slopes	42
Ne—Newark silt loam	42
No—Nolin silt loam	43
OpB—Opequon silty clay loam, 3 to 8 percent slopes	43
OpC—Opequon silty clay loam, 8 to 15 percent slopes	44
OpD—Opequon silty clay loam, 15 to 25 percent slopes	44
ORF—Opequon-Hagerstown complex, steep	45
Pe—Penlaw silt loam	45
Ph—Philo silt loam	46
Po—Pope soils	46
Pu—Purdy silt loam	46
Ru—Rubble land	47
Ty—Tyler silt loam	47
VaC—Vanderlip loamy sand, 5 to 15 percent slopes	47
WaB—Watson gravelly silt loam, 2 to 8 percent slopes	48
WaC—Watson gravelly silt loam, 8 to 15 percent slopes	48
WeB—Weikert shaly silt loam, 3 to 8 percent slopes	49
WeC—Weikert shaly silt loam, 8 to 15 percent slopes	50
WeD—Weikert shaly silt loam, 15 to 25 percent slopes	50

Summary of Tables

Page

Acreage and proportionate extent of the soils (Table 4)............................... 104
Juniata County. Mifflin County. Total—Area, Extent.

Building site development (Table 8) 118
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.

Capability classes and subclasses (Table 6) 109
Total acreage. Major management concerns (Subclass)—Erosion (e), Wetness (w), Soil problem (s).

Classification of the soils (Table 17) 177
Family or higher taxonomic class.

Construction materials (Table 10) 133
Roadfill. Sand. Gravel. Topsoil.

Engineering properties and classifications (Table 14) 156
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Probabilities of last freezing temperatures in spring and first in fall (Table 2).. 102
Dates for given probability and temperature—16° F or lower, 20°F or lower, 24° F or lower, 28° F or lower 32° F or lower.

Physical and chemical properties of soils (Table 15) 168
Depth. Permeability. Available water capacity. Soil reaction. Shrink-swell potential. Risk of corrosion—Uncoated steel, Concrete. Erosion factors—K, T.

Recreational development (Table 12) 144
Camp areas. Picnic areas. Playgrounds. Paths and trails.

Sanitary facilities (Table 9) 125
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Soil and water features (Table 16).. 174
Hydrologic group. Flooding—Frequency, Duration, Months. High water table—Depth, Kind, Months. Bedrock—Depth, Hardness. Potential frost action.

Summary of Tables—Continued

Page

Soil associations and their potential and limitations for specified use (Table 3) 103

Extent of area. Cultivated farm crops. Specialty crops. Woodland. Urban uses. Intensive and extensive recreation areas.

Temperature and precipitation (Table 1) 102

Temperature. Precipitation.

Water management (Table 11) 139

Pond reservoir areas. Embankments, dikes, and levees. Aquifer-fed excavated ponds. Drainage. Terraces and diversions. Grassed waterways.

Wildlife habitat potentials (Table 13) 151

Potential for habitat elements—Grain and seed crops, Grasses and legumes, Wild herbaceous plants, Hardwood trees, Coniferous plants, Wetland plants, Shallow-water areas. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife.

Woodland management and productivity (Table 7) 110

Ordination symbol. Management concerns—Erosion hazard, Equipment limitation, Seedling mortality, Windthrow hazard. Potential productivity—Important trees, Site index. Trees to plant.

Yields per acre of crops and pasture (Table 5) 106

Corn. Corn silage. Oats. Wheat. Alfalfa hay. Grass-legume hay. Pasture.

Foreword

This soil survey contains much information useful in land-planning programs in Juniata and Mifflin Counties. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

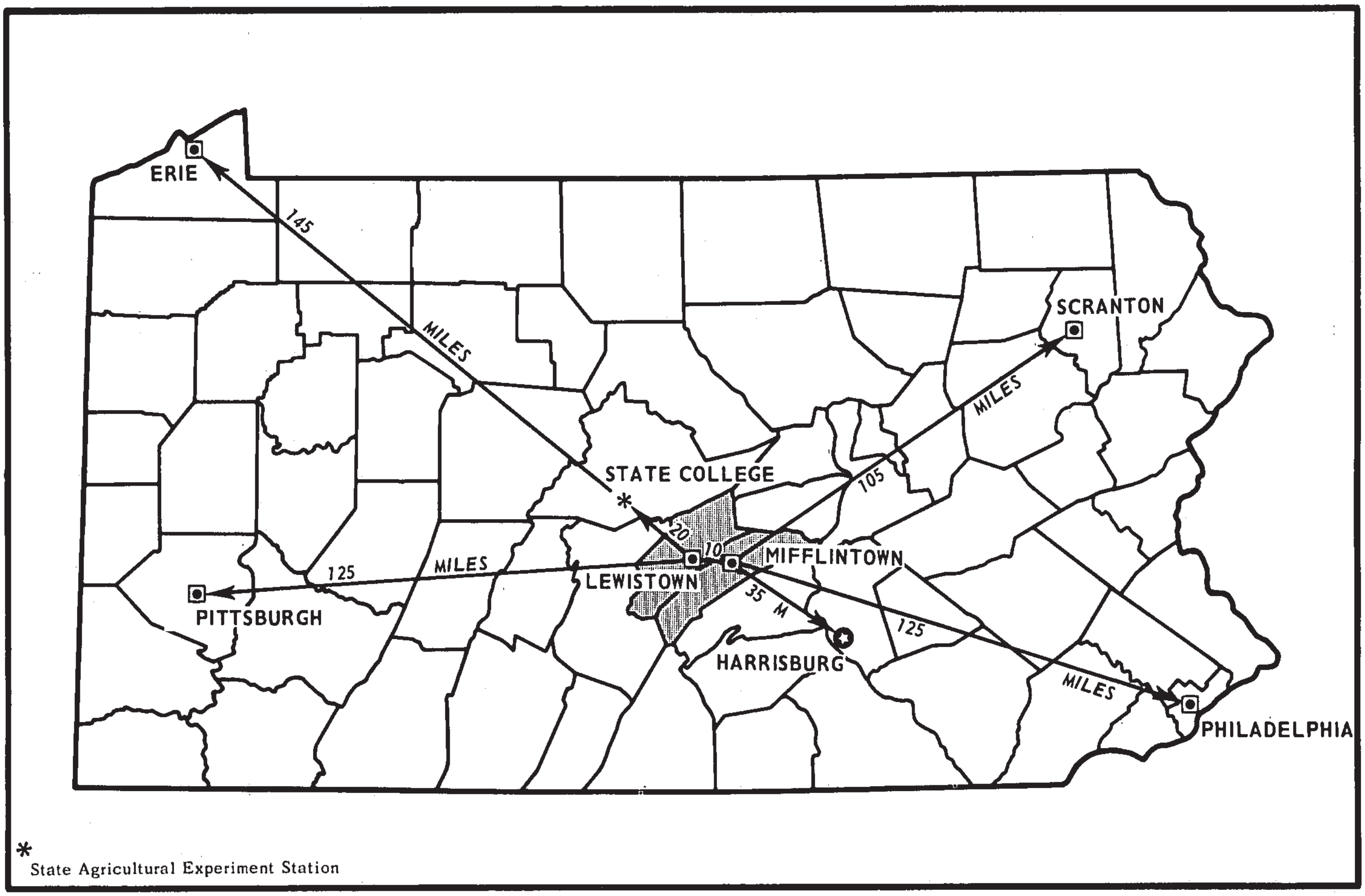
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Graham T. Munkittrick

Graham T. Munkittrick
State Conservationist
Soil Conservation Service



Location of Juniata and Mifflin Counties in Pennsylvania.

SOIL SURVEY OF JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA

By Garland H. Lipscomb and Dr. William H. Farley, Soil Conservation Service

Fieldwork by Dr. William H. Farley and Gerald D. Yoder, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service, in cooperation with the Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission

JUNIATA AND MIFFLIN COUNTIES are in the south-central part of Pennsylvania in the middle of the Appalachian Mountain section of the Ridge and Valley province. Elevation ranges from 450 feet to 2,100 feet above sea level. Juniata County has an area of 386.3 square miles, or 247,680 acres. Mifflin County has an area of 431 square miles, or 275,840 acres.

According to the 1970 census, Juniata County had a population of 16,712 in 4 boroughs and 13 townships. Mifflin County had a population of 45,000 in 6 boroughs and 10 townships.

Nearly all of the survey area is in the Juniata River Watershed, which in turn is part of the Susquehanna River Watershed. The principal tributary of the Juniata River in Mifflin County is the Kishacoquillas Creek, and in Juniata County it is the Tuscarora Creek.

The survey area is served by a network of Federal and State highways. Air connections are available at the Mifflin County Municipal Airport. One of the main east-west railroads provides daily train service for the area, and 15 local motor freight lines with nationwide connections service the area.

Facilities for recreation are numerous. The Department of Environmental Resources has established the Reeds Gap State Park with swimming facilities. The local Water Authority completed a 924,000,000 gallon capacity mountain water reservoir with fishing privileges. Industrial parks are located in both counties.

Early settlers of this area were of Scotch-Irish descent, and a later wave of settlers was of German descent. Most of the population of Mifflin County is concentrated in a belt about 3 miles wide running from Lewistown to Burnham. In Juniata County the population is concentrated in the boroughs of Mifflintown and Mifflin, which are connected by a bridge over the Juniata River.

General nature of the area

BRUCE A. BENTON, geologist, Soil Conservation Service, assisted in preparing the Geology and Water sections.

This section gives general information concerning the survey area. It discusses the climate, geology, and water resources of the area and briefly summarizes farming achievements.

Climate

Juniata and Mifflin Counties lie in the Ridge and Valley province of Pennsylvania, which is just southeast of the geographic center of the state. The elevation ranges from 480 feet along the Juniata River to 2,250 feet in the Pennsylvania State Forest in Mifflin County. The climate data in the following paragraphs are based on recorded data for Lewistown, Pennsylvania, unless otherwise stated. Climate data for Lewistown are given in table 1. Freeze dates in spring and fall are given in table 2.

The climate is humid continental. Most weather systems that affect the climate of the area originate in the midwest and are steered to the east by the prevailing westerly flow aloft. The primary source of moisture is the Gulf of Mexico, and a secondary source is the Atlantic Ocean. Considerable moisture is precipitated out of frontal systems as they move eastward and are lifted over the Appalachian Mountains west of Mifflin and Juniata Counties. Although less precipitation is received in Mifflin and Juniata Counties than in some of the more western counties of the State, the average annual rainfall amounts to about 38 inches.

Summers are warm and at times humid. Cloud cover is at a minimum during the summer when 60 percent of possible sunshine is received and the nights are generally clear. Daytime maximum temperatures reach the mid-80's, and nighttime lows are in the upper 50's. Maximum temperatures on 22 days during the summer may reach or exceed 90 degrees F. Minimum temperatures seldom drop below 45 degrees during the summer. Prevailing winds are from the southwest. In summer adequate rainfall is received from thunderstorms, which are observed on an average of 22 days each year.

Winters are cold and cloudy. The cloudiness is caused by the orographic lifting of cold fronts and their accom-

panying air masses which pass through the area frequently. Daily maximum temperatures average in the upper 30's, and nighttime minimum temperatures average in the lower 20's. Subzero temperatures are observed on an average of 2 days each winter. Prevailing winds are westerly. The first significant snowfall usually occurs in late November, and the last snowfall generally has occurred by mid-March. The amount of annual snowfall in the Lewistown area is about 28 inches.

Spring and fall are transition periods. Daytime temperatures of 70 degrees or higher are recorded in the area by late April and regularly in October. Warm days with abundant sunshine make fall one of the most pleasant times of the year.

The average growing season is 173 days. The average dates of the last spring freeze and first fall freeze are April 25 and October 15, respectively. Hurricane winds do not affect the area, but rainfall associated with these storms has been locally heavy. Damage due to wind and hail associated with a severe thunderstorm is recorded each year.

At the higher elevations in the counties, temperatures are approximately 3 to 5 degrees cooler. Precipitation is somewhat heavier due to orographic uplift. The growing season ranges from approximately 90 to 170 days.

Geology

Juniata and Mifflin Counties are in the Ridge and Valley province of the Appalachian Highlands (*5*). The topography of the survey area mainly results from differential weathering of the bedrock and has been strongly affected by folding. Rocks underlying the counties were formed during three recognized geological periods ranging from the oldest, or Ordovician, through the Silurian and Devonian periods. Major rock formations include the Bald Eagle, Juniata, Reedsville, Bellefonte, and Axemann Formations of the Ordovician epoch; the Keyser, Tonoloway, Wells Creek, Bloomsburg, Clinton, and Tuscarora Formations of the Silurian period; and the Marine beds, Hamilton Group, Oriskany Formation, and Helderberg Formation of the Devonian period.

The Bald Eagle, Tuscarora, and Juniata Formations and certain veins of limestone formations supply an abundance of stone for building. The highly weathered, easily crushed Oriskany Sandstone is used in concrete and glass making and as a mold in the iron and steel foundry.

The limestone quarries are small and scattered. Crushed stone for road work, portland cement, and agricultural lime are produced from these quarries. The weathered chert formations are used for road building as is the dark shale of the Marcellus and Reedsville Formations.

Water

Juniata and Mifflin Counties lie in the Susquehanna River drainage basin, although drainage from these counties enters the Susquehanna River at points outside the counties. The major streams in Juniata County are the Juniata River, West Branch Mahantango Creek, Lost Creek, Cocolamus Creek, and Tuscaroro Creek. In Mifflin County the major streams are the Juniata River, Kishacoquillas Creek, and Jacks Creek. In both counties many tributary streams drain into the major streams.

The water flowing in the streams of these counties is generally of good quality. Two large impoundments for municipal water supply are in the survey area: the Clearview Reservoir on Licking Creek furnishes water to Mifflintown and Mifflin, and the Laurel Run Reservoir serves Lewistown and vicinity.

Numerous other sites can be developed for municipal water supply, recreation, and other uses. However, some streams are polluted by waste disposal from individual homes and industrial sites and some by runoff from agricultural land. This pollution should be rectified before a site is developed for community use.

Wells and springs are the major sources of water for farms and rural homes. The quality of the water in the area varies with its rate of percolation through the rock. In most areas, the water quality is good.

In some areas underlain by formations of limestone and dolomite, the water is hard due to concentrations of calcium and magnesium. Sulphates only occasionally occur in the carbonate rocks. There is a hazard of ground water pollution if waste from disposal systems seeps through cavernous limestone. In general, sandstone and conglomerate formations yield soft water with small concentrations of dissolved iron. Shale and siltstone formations also yield soft water but commonly with concentrations of sulphides and iron that make the water less desirable for domestic use.

Farming

Farming is important to the economy of Juniata and Mifflin Counties. Most of the people derive their income from farming or farm-related industries.

In the past few years the number of farms, the average size of farms, and the total acreage farmed have decreased in the survey area. In 1964 there were 1,599 farms, and the average size was 147 acres. In 1969 there were 1,310 farms, and the average size was 144 acres. The total acreage farmed decreased from 235,145 acres in 1964 to 215,428 acres in 1969.

In 1969 about 1,850,000 bushels of corn; 240,000 bushels of wheat; and 81,000 tons of hay were grown. The number of livestock on farms in 1969 included about 37,400 cattle and calves; 14,150 hogs and pigs; 2,000 sheep and lambs; and about 413,000 chickens.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "Soil map for general planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

Soil map for general planning

The general soil map at the back of this publication shows, in color, soil associations that have a distinct pattern of soils and of relief and drainage. Each soil association is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations; but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one soil association differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The soils in the survey area vary widely in their potential for major land uses. Table 3 shows the extent of the soil associations shown on the general soil map and gives general ratings of the potential of each, in relation to the other associations, for major land uses. Soil properties that pose limitations to the use are indicated. The ratings of soil potential are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Each soil association is rated for *cultivated crops*, *specialty crops*, *woodland*, *urban uses*, and *recreation uses*. Cultivated crops are those grown extensively by farmers in the survey area. Specialty crops include vegetables, fruits, and nursery crops grown on limited acreage and generally requiring intensive management. Woodland refers to land that is producing either trees native to the area or introduced species. Urban uses include residential, commercial, and industrial developments. Intensive recreation uses include campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation uses include areas used for nature study and as wilderness.

Descriptions and potentials of soil associations

1. Hazleton-Laidig-Buchanan association

Deep, well drained and moderately well drained, nearly level to very steep soils on primary ridges and on benches and foot slopes

This association (fig.1), the largest in the survey area, makes up about 46 percent of the two counties. It is on the top, side, and foot slopes of the higher ridges. The soils formed in residual and colluvial materials weathered from acid sandstone and some shale. The landscape consists of narrow to moderately broad, nearly smooth to rolling ridgetops and steep side slopes. Broad benches and undulating foot slopes are near the bases of the ridges.

Hazleton soils make up 26 percent of this association. They are deep, well drained soils on the top and side of ridges.

Laidig soils make up 22 percent of the association. They are deep, well drained soils that have a fragipan and are mainly on benches and foot slopes.

Buchanan soils make up 11 percent of the association. They are deep, moderately well drained soils that have a fragipan and are mainly in the lower lying areas of ridgetops, benches, and foot slopes.

Well drained Dekalb and Leetonia soils, poorly drained Andover soils, and Rubble land make up the remaining 41 percent of this association.

This association is mainly wooded because it is too stony for cultivated crops. Some areas are used for crops and pasture. The nonstony areas are suited to most farm uses if adequately managed to control erosion and conserve moisture. Surface stones, slow permeability, slope, and wetness are the major limitations for most uses.

2. Berks-Weikert association

Moderately deep and shallow, well drained, nearly level to steep soils on secondary ridges and hills

This association (fig.2) makes up about 22 percent of the survey area. It is on secondary ridges and hilly uplands in both counties. The soils formed in materials weathered from gray shale and siltstone. The landscape consists of gently rolling to steep ridges and rounded oblong hills.

Berks soils make up 50 percent of the association. They are moderately deep, well drained soils mainly on the top and upper side slopes of ridges and hills.

Weikert soils make up 20 percent of the association. They are shallow, well drained soils mainly on the sides of ridges and hills.

Poorly drained Brinkerton soils and moderately well drained Ernest soils on the uplands and moderately well drained Philo soils and poorly drained Atkins soils on flood plains make up the remaining 30 percent of this association.

This association is mainly used for cultivated crops. Some areas are used for woodland and pasture. A few small areas are quarried for shale. If management practices are adequate to conserve moisture and control erosion, this association is fairly well suited to most farm uses. Shallowness to bedrock, slope, and limited available water capacity are the major limitations for most uses.

3. Hagerstown-Opequon-Murrill association

Deep and shallow, well drained, nearly level to moderately steep soils in upland valleys

This association (fig.3) makes up about 10 percent of the survey area. It is mostly in the Kishacoquillas and Ferguson Valleys in Mifflin County. The soils formed in material weathered from limestone and in sandstone and siltstone colluvium overlying limestone. The landscape consists of gently sloping to rolling and hilly valley floors and foot slopes and some low ridge protrusions.

Hagerstown soils make up 42 percent of the association. They are deep, well drained soils on the valley floors.

Opequon soils make up 25 percent of the association. They are shallow, well drained soils on low ridges.

Murrill soils make up 12 percent of the association. They are deep, well drained soils on broad, low foot slopes.

Well drained Nolin soils, somewhat poorly drained and poorly drained Newark soils, and poorly drained Melvin soils along streams and somewhat poorly drained Penlaw soils on the uplands make up the remaining 21 percent of this association.

This association is mainly used for crops. Some areas are used for pasture and woodland, and a few small areas are the sites of towns and villages. A few limestone quarries are in the association. If management practices are adequate to control erosion and conserve moisture, this association is well suited to most farm uses. It has some of the most productive soils in the survey area. Clayey texture and depth to bedrock are the major limitations for most uses. If the soils are used for onsite waste disposal there is potential pollution of ground water because the waste drains into caverns and solution channels in the underlying bedrock.

4. Edom-Klinesville-Weikert association

Deep and shallow, well drained, nearly level to very steep soils on ridges and in valleys on uplands

This association makes up about 7 percent of the survey area. It is on ridges and valley floors in both counties. The soils formed in material that weathered from impure shaly limestone and acid red and gray shale. The landscape consists of gently undulating valleys to hilly ridges that have some steep and very steep side slopes.

Edom soils make up about 54 percent of the association. They are deep, well drained soils on valley floors.

Klinesville soils make up 25 percent of the association. They are shallow, well drained soils on the red shale ridges.

Weikert soils make up 10 percent of the association. They are shallow, well drained soils on the gray shale ridges.

Somewhat poorly drained Penlaw soils on valley floors, well drained Allenwood and Berks soils on ridges, and somewhat poorly drained and poorly drained Newark soils and poorly drained Melvin soils along streams make up the remaining 11 percent of this association.

Most of this association is used for cultivated crops. Some areas are wooded. If management practices are adequate to conserve moisture and control erosion, this association is suited to most farm uses. Depth to bedrock, slope, and limited available water capacity are the major limitations in most areas. Ground water pollution is a potential hazard in the soils derived from the shaly limestone if they are used for waste disposal.

5. Mertz-Elliber-Kreamer association

Deep, well drained and moderately well drained, nearly level to very steep soils on secondary ridges

This association makes up about 7 percent of the survey area. It is on upland ridges in both counties. The soils formed in material that weathered from very cherty limestone and siltstone. The landscape consists of gently undulating to very steep rounded ridges that have long side slopes and foot slopes.

Mertz soils make up 45 percent of this association. They are deep, well drained soils on upper side slopes and on foot slopes of ridges.

Elliber soils make up 25 percent of the association. They are deep, well drained soils on the top and sides of ridges.

Kreamer soils make up 9 percent of the association. They are deep, moderately well drained soils on foot slopes.

The somewhat poorly drained Evendale soils on the lower foot slopes and the somewhat poorly drained and poorly drained Newark soils and poorly drained Melvin soils along streams make up the remaining 21 percent of this association.

Most of this association is used for cultivated crops. Some areas are used for woodland and pasture. If management practices are adequate to control erosion and conserve moisture, this association is suited to most farm uses. High content of coarse fragments, moderately slow and slow permeability, slope, and wetness are the major limitations for most uses.

6. Atkins-Monongahela-Allegheny association

Deep, poorly drained, moderately well drained, and well drained, nearly level to gently sloping alluvial soils on flood plains and terraces

This association makes up about 5 percent of the survey area. It is along rivers and major streams in both counties. The soils formed in alluvial material derived largely from acid sandstone, siltstone, and shale. The landscape consists of nearly flat flood plains and nearly smooth to gently rolling terraces.

Atkins soils make up about 23 percent of the association. They are deep, poorly drained soils on flood plains.

Monongahela soils make up about 22 percent of the association. They are deep, moderately well drained soils on terraces.

Allegheny soils make up 17 percent of the association. They are deep, well drained soils on terraces.

Well drained Pope soils and moderately well drained Philo soils on the flood plains and somewhat poorly drained Tyler soils and poorly drained to very poorly drained Purdy soils on terraces make up the remaining 38 percent of this association.

Most of this association is used for crops and pasture. A few areas are used for woodland, and a few areas are the sites of towns and villages. If drainage and other management practices are adequate, this association is suited to most farm uses. Flooding and wetness are the major limitations for most uses.

7. Morrison association

Deep, well drained, gently sloping to moderately steep soils on secondary ridges

This association (fig.4) is the least extensive in the survey area and makes up about 3 percent of the area. It is on upland ridges, mostly in Juniata County. The soils formed in material that weathered from sandstone. The landscape consists of gently undulating to rolling, moderate to broad ridgetops and rolling to hilly side slopes.

Morrison soils make up 88 percent of this association. They are deep, well drained soils on ridgetops and side slopes.

Well drained Mertz and Vanderlip soils, poorly drained Brinkerton soils, moderately well drained Ernest soils on uplands, and moderately well drained Philo soils and poorly drained Atkins soils along streams make up the remaining 12 percent of this association.

About half of this association is used for crops, pasture, and orchards. The remaining areas are used mainly for woodland. If management practices are adequate to control erosion and conserve moisture, this association is suited to most farm uses. Coarse fragments and slope are the major limitations for most uses.

Broad land use considerations

General ratings of the potential of each soil association for several land uses are indicated in table 3. The ratings do not consider location in relation to existing facilities but are based on the inherent suitability of the soils and landscapes.

Farming has long been the most important land use in this survey area, and most of the soil associations have fair to good potential for farming. However, there is a growing interest in nonfarm uses in the area.

There is some question as to which land should be used for urban development. There are few areas where the soils and landscapes in the county are so unfavorable that urban development is not feasible; however, sizeable areas of the Atkins-Monongahela-Allegheny association are flood plains on which flooding and ponding are severely limiting. Also, the extremely stony, steep areas of the Hazleton-Laidig-Buchanan association are very seriously limited for urban development.

Sizeable areas of the county have soils and landscapes well suited for urban development. These include those well drained parts of the Atkins-Monongahela-Allegheny association that are not on flood plains; the Morrison association; the nonstony and less sloping areas of the Hazleton-Laidig-Buchanan association; and the less sloping areas of the Mertz-Elliber-Kreamer associations. However, all of these associations except the Hazleton-Laidig-Buchanan association are excellent for use as farmland, and this suitability should not be overlooked when broad land uses are considered.

Extremely stony surfaces and steep slopes are the main limitations to urban development of the Hazleton-Laidig-Buchanan association. With the removal of stones, the less sloping areas become suitable for many urban uses. Because the numerous surface stones also limit farming, only a small acreage of this association is cultivated. This association is suitable for woodland, wildlife, and those recreation uses that are not affected by surface stones.

The Berks-Weikert association is seriously limited for urban development by its moderate to shallow depth to rock and high content of coarse fragments. Some building site development can be considered because the bedrock is rippable; however, there is a severe hazard of ground water pollution by onsite disposal of waste. The association is well suited to parks and recreation areas that are not affected by the rock fragments in the soils. Farming is fairly productive where adequate water management practices are applied. Practices to protect the soils from erosion are often needed.

The Hagerstown-Opequon-Murrill and Edom-Klinesville-Weikert associations are seriously limited for urban uses by low strength, shallow depth to rock, cavernous rock, and sinkholes. Ground water moving through cavernous rock is subject to contamination from waste disposal systems, and sinkholes are severe hazards for building. However, these two associations include some of the most productive soils in the county and are excellent for farming and specialty crops. Practices that help retain soil moisture and control erosion are needed for optimum production. High clay content and high shrink-swell potential are the major limitations for recreation uses. These associations are well suited to woodland and wildlife habitat. The less sloping areas of the Mertz-Elliber-Kreamer association have few limitations for most urban uses, but moderately slow permeability has to be considered in planning onsite waste disposal systems. The high percentage of rock fragments in the soils is the major limitation for parks and other recreational uses. If management practices include erosion control, soil moisture retention, and proper drainage, this association has good potential for farming and specialty crops. It can also be used for woodland and recreation.

Flooding and wetness severely limit the Atkins-Monongahela-Allegheny association for urban uses, except for a few areas that are not subject to flooding and are well drained. Parks and recreation areas and picnic areas are well suited. If adequately drained, this association has excellent potential for farming and specialty crops.

The Morrison association has fewer limitations for nonfarm uses than any of the other associations. Except for slope in the steeper areas and rock fragments, this association has good potential for most community uses.

Broad land use patterns that make use of the natural quality and potentials of the soils and landscape are beneficial to the community. Urban developments on soils that are poorly suited to farming and farming on soils that are well suited to farming and poorly suited to nonfarm uses assures both the maximum productive capacity and highest environmental quality of the area.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Planning the use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they

cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Rubble land is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions and potentials

AbB—Allegheny loam, 2 to 8 percent slopes. This nearly level to gently sloping, deep, well drained soil is on old alluvial terraces. Slopes are generally smooth and concave. The areas are irregular in shape and are about 2 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown loam about 9 inches thick. The subsoil extends to a depth of 40 inches. The upper 7 inches is strong brown, friable heavy silt loam; the next 7 inches is dark brown heavy loam; and the lower 17 inches is yellowish brown firm clay loam. The substratum to a depth of 67 inches is strong brown, very firm gravelly sandy clay loam.

Included with this soil in mapping are a few areas of moderately well drained Monongahela soils.

This soil has moderate permeability and high available water capacity. Runoff is medium. In unlimed areas the soil is strongly acid to very strongly acid.

Most of the acreage of this soil is cropland, and small areas are used for woodland. This soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good.

If this soil is used for cultivated crops, it is moderately subject to erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system help maintain the organic matter content and good tilth.

If this soil is used for pasture, management should provide proper stocking rates to help maintain a desirable balance of plants and rotation grazing. For optimum production, the level of fertility must be maintained by periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is good. Management concerns are slight. Machine planting of trees is practical in large areas.

This soil has few limitations for nonfarm uses. Wetness is a limitation to the use and management of the included Monongahela soil. Capability subclass IIe.

AdB—Allenwood gravelly silt loam, 2 to 8 percent slopes. This nearly level to gently sloping, deep, well drained soil is at the base of ridges in the valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are 2 to 15 acres in size.

In a typical profile the surface layer is dark brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 41 inches. The upper 5 inches is reddish brown, friable gravelly silt loam; the next 8 inches is reddish yellow, firm, gravelly heavy silt loam; and the lower 20 inches is reddish yellow, firm, gravelly heavy silt loam. The substratum to a depth of 60 inches is red, firm, gravelly silty clay loam.

Included with this soil in mapping are a few areas of well drained Allegheny soils, a few areas of moderately well drained Watson soils, and scattered areas of poorly drained Alvira soils.

This soil has moderate to moderately slow permeability and high available water capacity. Runoff is medium. The soil has 15 percent or more gravel in the surface layer. In unlimed areas the soil is very strongly acid to extremely acid throughout.

Most of the acreage of this soil is cleared, and small areas are used for woodland. This soil has excellent potential for farming, and it has excellent potential for pasture and trees. The potential for homesites is good, but in some areas the moderately slow permeability may present problems for onsite sewage disposal. It is also good for most other nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system maintain organic matter content and good tilth. Where

the topography is suitable, stripcropping can be used to reduce erosion. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

If this soil is used for pasture, management should provide proper stocking rates to maintain desirable plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is excellent. Management concerns are slight. Machine planting of trees is practical in large areas.

This soil is somewhat limited for nonfarm uses because of its gravelly surface. In some areas the moderately slow permeability is a limitation for onsite waste disposal.

Wetness is a limitation in use and management of the included Watson and Alvira soils. Capability subclass IIe.

AdC—Allenwood gravelly silt loam, 8 to 15 percent slopes. This sloping, well drained soil is on the sides of ridges in valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and normally range from 2 to 15 acres in size.

In a typical profile, where this soil has been cultivated, the surface layer is dark brown gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 40 inches. The upper 5 inches is brown, friable, gravelly silt loam; the next 8 inches is reddish yellow, firm, gravelly heavy silt loam; and the lower 19 inches is reddish yellow, firm, gravelly heavy silt loam. The substratum, which extends to a depth of 60 inches, is red, firm, gravelly silty clay loam. Bedrock is below a depth of 60 inches.

Included in mapping are small areas of well drained Allegheny soils and moderately well drained Watson soils. Also included are small areas of poorly drained Alvira soils.

This well drained soil has moderate to moderately slow permeability and high available water capacity. Where unlimed, the soil is very strongly acid to extremely acid throughout. Runoff is medium.

Most of the acreage of this soil is farmed, but small areas are used for woodland. This soil has excellent potential for farming and is used mainly for cultivated crops. It has excellent potential for pasture and for woodland. Slope is a limitation for some nonfarm uses. In some areas the moderately slow permeability presents problems for onsite waste disposal.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping also can be used where the topography is suitable. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

If this soil is used for pasture, management needs include proper stocking rates to maintain a balance of desirable plants and rotation grazing. For optimum production, the level of fertility needs to be maintained through periodic applications of nutrients.

Some areas of this soil are wooded. Productivity is excellent. Logging roads should be on the contour to reduce erosion when the trees are harvested. Machine planting in large areas is generally practical.

This soil is limited for some nonfarm uses by slope. In some areas the moderately slow permeability limits onsite waste disposal. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

A seasonal high water table is a limitation in the use and management of the included Watson and Alvira soils. Capability subclass IIIe.

AdD—Allenwood gravelly silt loam, 15 to 25 percent slopes. This moderately steep, well drained soil is on the sides of ridges in valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and normally range from 2 to 15 acres in size.

In a typical profile, where this soil has been cultivated, the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil extends to a depth of 40 inches. The upper 4 inches is brown, friable, gravelly silt loam; the next 8 inches is reddish yellow, firm, gravelly heavy silt loam; the lower 21 inches is reddish yellow, firm, gravelly heavy silt loam. The substratum is red, firm gravelly silty clay loam. Bedrock is below a depth of 60 inches.

Included in mapping are small areas of well drained Allegheny soils and moderately well drained Watson soils. Also included are small areas of somewhat poorly drained Alvira soils.

This well drained soil has moderate to moderately slow permeability and high available water capacity. Where unlimed, it is very strongly acid to extremely acid throughout. Runoff is medium, and the erosion hazard is high.

This soil has fair to good potential for farming. It is used mainly for grass and has excellent potential for pasture and for woodland. Slope is a limitation for most nonfarm uses.

If this soil is used for cultivated crops, the severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and a lower available water capacity for plants. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. Incorporating some crop residue and manure into the surface layer will help maintain organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management needs are proper stocking rates to maintain a balance of desirable plants and rotation grazing. For optimum production, the

level of fertility needs to be maintained through periodic applications of nutrients.

Some areas of this soil are wooded. Productivity is excellent. Logging roads should be constructed on the contour to reduce erosion at harvest time. Erosion is a hazard when the soil is disturbed. Machine planting of trees in large areas is generally practical.

This soil is limited for most nonfarm uses by slope. In some areas the moderately slow permeability presents problems for waste disposal. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

Wetness limits the use and management of the included Watson and Alvira soils. Capability subclass IVe.

AlB—Alvira silt loam, 2 to 8 percent slopes. This deep, somewhat poorly drained, nearly level to gently sloping soil is in depressions on the glaciated uplands. The areas are irregular in shape and normally range from 2 to 20 acres in size.

In a typical profile, this soil has a brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 60 inches. The upper 5 inches is yellowish brown, firm, heavy silt loam; the next 10 inches is strong brown, firm, heavy silt loam; and the next 35 inches is yellowish brown, firm and brittle, gravelly silt loam.

Included with this soil in mapping are small areas of moderately well drained Watson soils and scattered areas of wetter soils.

This soil is slowly permeable, and the available water capacity is moderate. Reaction ranges from strongly acid to extremely acid throughout where the soil is unlimed. A seasonal high water table is within 6 to 18 inches of the surface for a good part of the year. Runoff is slow. The rooting depth is restricted by the high water table and a fragipan.

Most areas of this soil are used for permanent pasture. If properly drained, this soil can be used for row crops. This soil has good potential for growing trees. The seasonal high water table and slow permeability limit its potential for many nonfarm uses.

If used for cultivated crops, this soil is moderately subject to erosion. Excess water causes the soil to warm slowly in spring, and crops are sometimes damaged by ponded water following intensive rainfall. Excess water can be drained away by keeping natural drainageways open and by installing open drains and tile drains where outlets are available.

The soil has good potential for permanent pasture. Grazing of pasture when the soil is wet and overgrazing are major concerns of management. If the pasture is grazed when wet, the surface layer of the soil will become compacted. Proper stocking rates to maintain a desirable plant community, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil has good potential for growing trees, and part of the acreage is wooded. The rooting depth is restricted, however, by the seasonal high water table and a fragipan. Use of equipment is restricted for part of the year because of the seasonal high water table. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of the seasonal high water table and slow permeability. It has some potential for wildlife and recreational uses.

Similar limitations in use and management apply to the included Watson soils. Capability subclass IIIw.

AnB—Andover gravelly loam, 2 to 8 percent slopes. This nearly level to gently sloping, poorly drained soil is on benches and concave foot slopes and in swales along the base of ridges. Slopes are generally smooth and concave. The areas are irregular in shape and range from about 2 to more than 4 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 6 inches thick. The subsoil is about 44 inches thick. It is light brownish gray, firm gravelly loam in the upper 12 inches and yellowish brown and brown, firm and brittle gravelly clay loam in the lower 32 inches. The substratum to a depth of 60 inches is brown, firm, very gravelly sandy clay loam.

Included with this soil in mapping are a few areas of Buchanan gravelly loam and a few areas of stony Andover soils.

This soil has slow permeability and moderate available water capacity. Runoff is slow to medium. The subsoil has a fragipan, which restricts the downward movement of water. This soil has a water table within 6 inches of the surface most of the year. The rooting depth is restricted by the fragipan. In unlimed areas the soil is strongly acid to very strongly acid throughout.

Most areas of this soil are used for permanent pasture. Some small areas are used for woodland. This soil is best suited to grass and pasture. It is poorly suited to cultivated crops but it has good potential for growing trees. The high water table, slowly permeable subsoil, and coarse fragments limit its potential for many nonfarm uses.

Where this soil is used for cultivated crops, the hazard of erosion is moderate. Excess water causes the soil to warm slowly in the spring. Production of cultivated crops is severely reduced by the wetness of the soil. Where outlets are available, open drains and covered drains can be used to remove excess water. The gravelly surface layer may interfere with the seeding and harvesting of some crops.

The soil has good potential for pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a community of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small acreage remains wooded and many of the idle fields are reverting to trees. Rooting depth is restricted by the high water table and fragipan. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons

because of the high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it is slowly permeable and has a high water table. Slow permeability and the high water table are also limitations for onsite disposal of waste and use of the soil for buildings. The soil has some potential for wildlife and recreational uses.

There are fewer limitations to the use and management of the included Buchanan soils. Capability subclass IVw.

AoB—Andover extremely stony loam, 0 to 8 percent slopes. This nearly level to gently sloping, poorly drained soil is on benches and concave foot slopes and in swales along the base of prominent ridges. Slopes are generally 400 to 1,000 feet in length and are mainly smooth and concave. The areas are irregular in shape and 2 to more than 4 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 3 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is light brownish gray, firm gravelly loam; the next 14 inches is yellowish brown, firm and brittle gravelly clay loam; and the lower 21 inches is brown, firm gravelly clay loam. The substratum to a depth of 60 inches is brown, firm very gravelly sandy clay loam.

Included with this soil in mapping are small areas of extremely stony Buchanan soils. A few scattered areas of extremely stony Laidig soils are also included.

This soil has slow permeability and moderate available water capacity. Runoff is slow. The subsoil has a fragipan. A water table is within 6 inches of the surface during most of the year. The rooting depth is restricted by the fragipan and high water table. In unlimed areas, the soil is strongly acid and very strongly acid throughout.

Most of the acreage of this soil is in woodland and poorly managed permanent pasture. This soil is best suited to trees; it is too stony and wet for cultivated crops and pasture. The stony surface, high water table, and slowly permeable fragipan limit its potential for most nonfarm uses.

Where this soil is used for woodland, pruning of undesirable trees increases wood production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil has limitations for most nonfarm uses. Slow permeability and the high water table are limitations for the disposal of waste. The high water table and stoniness are limitations for buildings with subsurface basements. When buildings with basements are constructed in this soil, foundation drains with proper outlets are necessary to prevent seepage of water into basements. Capability subclass VIIs.

AoC—Andover extremely stony loam, 8 to 15 percent slopes. This sloping, extremely stony, poorly drained soil is on benches and concave foot slopes and in swales along the sides of prominent ridges. Slopes are generally concave. The areas are irregular in shape and range from about 2 to more than 4 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 3 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is light brownish gray, firm gravelly loam; the next 14 inches is yellowish brown, firm and brittle gravelly clay loam and the lower 21 inches is brown, firm gravelly clay loam.

Included with this soil in mapping are a few areas of extremely stony Buchanan soils.

This soil has slow permeability and a moderate available water capacity. Runoff is medium. The subsoil has a slowly permeable fragipan. A water table is within 6 inches of the surface for long periods of the year. The rooting depth is restricted by the fragipan and a high water table. In unlimed areas, the soil is strongly acid to very strongly acid throughout.

Most areas of this soil are wooded. This soil is suited to moisture-tolerant trees. It is too stony and too wet for crops or pasture. The soil has poor potential for most nonfarm uses because of the high water table, stony surface, and slow permeability.

This soil is not used for cultivated crops or for pasture because of the high water table and numerous surface stones. It is not feasible to remove the surface stones and lower the water table because of the expense involved.

Much of the acreage of this soil is in natural woodland, and many of the idle fields that were formerly cultivated are reverting to trees. Productivity is good, but the rooting depth is restricted by the fragipan and high water table. Pruning of undesirable trees increases production. Logging roads should be constructed on the contour to reduce erosion at harvest time. Use of equipment is restricted for a good part of the year by wetness caused by the high water table. Also, large surface stones interfere with seeding and harvesting.

This soil is limited for most nonfarm uses because of slow permeability, a high water table, and surface stones. Slow permeability and the high water table are limitations for onsite disposal of waste. Wetness is a potential hazard for buildings with subsurface basements.

There are similar limitations to the use and management of the included Buchanan soils. Capability subclass VIIs.

As—Ashton silt loam. This is a nearly level to gently sloping, deep, well drained soil on low stream terraces. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 10 acres in size.

In a typical profile the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil extends to a depth of 43 inches. The upper 5 inches are dark brown, friable silt loam; the next 4 inches are brown, friable silt loam; and the lower 25 inches are dark brown, firm silt loam. The substratum to a depth of 60 inches is brown, very friable fine sandy loam.

Included with this soil in mapping are a few areas of Chavies soils and scattered areas of Monongahela soils.

This soil has moderate permeability and high available water capacity. Runoff is slow. In unlimed areas, the soil is neutral to medium acid throughout the profile.

Most of the acreage of this soil is used for crops. The soil has good potential for cultivated crops, and it is also suited to pasture and trees. It is suited to most nonfarm uses except those affected by rare flooding.

If this soil is used for cultivated crops, there is a slight to moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system are practices that help maintain the organic-matter content and good tilth of the soil.

If this soil is used for pasture, management should provide proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, the level of soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good. Management concerns are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm use because of rare flooding. It has poor potential for homesites. The very rapid permeability of the substratum may cause contamination of ground water when this soil is used for onsite waste disposal.

There are greater limitations to the use and management of the included Monongahela soils than of the Ashton silt loam and the included Chavies soils. Capability class I.

At—Atkins silt loam. This is a deep, poorly drained, nearly level soil on flood plains, mainly along the major streams throughout the survey area. The areas are irregular in shape and normally range from 2 to 15 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 40 inches. It is gray, friable silty clay loam. The substratum to a depth of 66 inches is gray, friable silt loam.

Included with this soil in mapping are small areas of Philo soils and scattered spots of very poorly drained soils.

This soil is slowly to moderately permeable, and the available water capacity is high. Reaction is strongly acid or very strongly acid throughout where the soil is unlimed. A high water table is within 6 inches of the surface during part of the year. Runoff is slow. The rooting depth is restricted by the high water table.

Most areas of this soil are used for permanent pasture. If properly drained this soil can be used occasionally for row crops. It has fair to good potential for growing trees. The high water table and flooding limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in the spring, and crops may be damaged by flooding following intensive rainfall. Excess surface water can be drained away by keeping natural drainageways open or by installing open drains, where outlets are available.

The soil has fair potential for permanent pasture. Grazing when wet and overgrazing are major concerns of pasture management. If the pasture is grazed when the soil is wet, the surface layer will become compacted. Proper stocking rates to maintain a balance of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is fairly suited to moisture-tolerant trees, and a small acreage is wooded. Potential productivity is fair, but the rooting depth is restricted by the high water table. Use of equipment is restricted during much of the year because of wetness resulting from the high water table. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of the high water table and flooding. It has some potential for wildlife and recreational uses.

Limitations to the use and management of the included Philo soils are not as severe as those of the Atkins soil. Capability subclass IVw.

BkB—Berks shaly silt loam, 2 to 8 percent slopes. This nearly level to gently sloping soil is on benches and foot slopes of dissected uplands. The areas are usually irregular in shape and range from 2 to 30 acres or more in size.

A typical profile of this soil in a cultivated area has a dark brown friable shaly silt loam surface layer 5 inches thick. The subsoil extends to a depth of 27 inches. The upper part is yellowish brown, friable shaly silt loam; and the lower 10 inches is strong brown, friable very shaly silt loam. The substratum is strong brown, friable very shaly silt loam. Fractured shale bedrock is at a depth of 32 inches.

Included in mapping are small areas of Weikert and Ernest soils. Also included are small areas of well drained soils that are more than 40 inches deep to bedrock.

This well drained soil has moderately rapid permeability and low available water capacity. Where unlimed the soil is very strongly acid to strongly acid in the surface layer and subsoil and is medium acid to very strongly acid in the substratum. Runoff is medium. The rooting depth is restricted by the fractured shale or siltstone.

This soil has fair potential for farming and is used mainly for general farm crops. It has fair potential for pasture. For woodland the potential is good. Depth to the underlying rock and shale fragments in the soil are limitations for some nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and the lowering of available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, cover crops, and including grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain organic matter content and reduce the tendency of the soil to clod and crust.

When this soil is used for pasture, proper stocking rates to maintain a desirable balance of plants and rotation grazing are the chief managment needs. For optimum production, the level of soil fertility needs to be maintained through periodic applications of nutrients.

A considerable acreage of this soil is wooded. Productivity is good, but the rooting depth is restricted by shale or siltstone bedrock. A major management problem is a moderate loss of seedlings due to the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of depth to shale and siltstone bedrock and the high percentage of shale fragments in the soil. The moderate depth to the underlying rock limits the disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices may be needed to control erosion and sediment.

The Weikert and Ernest soils included in mapping have more limitations to use and management than this Berks soil. The Weikert soils are shallower to rock, and the Ernest soils are moderately well drained. Capability subclass IIe.

BkC—Berks shaly silt loam, 8 to 15 percent slopes. This sloping, moderately deep, well drained soil is on the sides of foothills of dissected uplands. The areas are irregular in shape and are 2 to 30 acres in size.

In a typical profile the surface layer is dark brown, friable shaly silt loam about 5 inches thick. The subsoil extends to a depth of 25 inches. The upper 10 inches is yellowish brown, friable shaly silt loam, and the lower 10 inches is strong brown, friable very shaly silt loam. The substratum is strong brown, friable very shaly silt loam. Fractured shale bedrock is at a depth of 32 inches.

Included with this soil in mapping are a few areas of shallow Weikert soils and moderately well drained Ernest soils and scattered areas of well drained soils that are more than 40 inches deep to bedrock.

This soil has moderately rapid permeability and low available water capacity. There is more than 25 percent shale in the surface layer. In unlimed areas the soil is very strongly acid to strongly acid in the surface layer and subsoil and is medium acid to very strongly acid in the substratum. Runoff is medium. The rooting depth may be restricted by fractured shale or siltstone bedrock.

The soil has fair to good potential for farming, and it is fairly suited to pasture and trees. The potential for homesites is good but for other nonfarm uses is poor.

Where this soil is used for cultivated crops, the hazard of erosion is moderate. Crops respond fairly well to fertilizer and good management. Growing cover crops, using crop residue and manure, and including hay in the cropping system are practices that help maintain the organic-matter content and good tilth of the soil. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grass and legumes in the cropping system.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, the level of soil fertility needs to be maintained through periodic applications of nutrients.

The soil is suited to trees. Productivity is good, but rooting depth is restricted by the depth to shale or siltstone bedrock. A major management problem is a moderate loss of seedlings due to the high percentage of shale fragments in the soil. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of depth to bedrock, slope, and coarse fragments. Depth to bedrock is a limitation for onsite waste disposal.

The Weikert and Ernest soils included in mapping have more limitations to use and management than this Berks soil. Capability subclass IIIe.

BlD—Berks-Weikert shaly silt loams, 15 to 25 percent slopes. These moderately deep and shallow, well drained, moderately steep soils are on the sides of foothills and prominent hills of dissected uplands. The areas are usually irregular in shape and range from 2 to 50 acres or more in size. The Berks soils make up about 55 percent of this complex, the Weikert soils make up 35 percent, and the rest is included soils of minor extent.

In a typical profile the Berks soil has a dark brown, friable shaly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of 25 inches. The upper 10 inches is yellowish brown, friable shaly silt loam; and the lower 10 inches is strong brown, friable very shaly silt loam. The substratum is strong brown, friable very shaly silt loam. Fractured shale bedrock is at a depth of 30 inches.

In a typical profile, the Weikert soil has a dark brown, shaly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of 12 inches and is yellowish brown, friable very shaly silt loam. The substratum to a depth of 15 inches is yellowish brown, friable very shaly silt loam. Dark gray shale bedrock is at a depth of 15 inches.

These soils are mapped together because they occur in such intricate patterns that it is not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded and very shallow soils. Small areas of soils deeper than 40 inches are also included.

These soils have moderately rapid to rapid permeability and low to very low available water capacity. Where unlimed, the soils are strongly acid to very strongly acid. Runoff is medium. The rooting depth is restricted by the bedrock.

These soils have fair potential for farming but are used mainly for woodland and grassland. They have fair potential for pasture and woodland and poor potential for most nonfarm uses.

If these soils are used for cultivated crops, the severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower availa-

ble water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping systems. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

If the soils are used for pasture, management should include proper stocking rates to help maintain a desirable balance of plants and rotation grazing. For optimum production, the level of soil fertility needs to be maintained through periodic applications of nutrients.

A large acreage of this soil is in woodland. Productivity is fair to good. Rooting depth is restricted by the shale bedrock. A management problem is a moderate to heavy loss of seedlings due to the very low to low available water capacity and the high percentage of shale fragments in the subsoil. Machine planting of large areas is generally practical. Logging roads should be constructed on the contour to reduce erosion during harvesting.

These soils are limited for nonfarm uses because of the depth to bedrock, very low to low available water capacity, slope, and coarse fragments. The restricted depth to bedrock may be a problem in excavating for buildings and is a limitation for onsite waste disposal. If this soil is disturbed for construction, management practices are needed to control erosion.

The severely eroded and very shallow soils included in mapping have more severe problems in use and management than the Berks and Weikert soils. Capability subclass IVe.

BMF—Berks-Weikert association, steep. These moderately deep and shallow, well drained, steep soils are on the sides of foothills and prominent hills of dissected uplands. Slopes range from 25 to 60 percent. The areas are usually irregular in shape and range from 2 to 100 acres in size. The Berks soils make up about 60 percent of this association, and the Weikert soils make up 30 percent. The rest is minor soils.

In a typical profile the Berks soils have a dark brown, friable, shaly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of 25 inches. The upper 10 inches is yellowish brown, friable shaly silt loam; and the lower 10 inches is strong brown, friable very shaly silt loam. The substratum is strong brown, friable, very shaly silt loam. Fractured shale bedrock is at a depth of 30 inches.

In a typical profile the Weikert soils have a dark brown, shaly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of 12 inches and is yellowish brown, friable, very shaly silt loam. The substratum is yellowish brown, friable, very shaly silt loam. Dark gray shale bedrock is at a depth of 15 inches.

Because of the steepness of slope and the moderately deep to shallow depth to bedrock, these soils were not investigated so thoroughly as other soils in the survey area. They were not mapped separately because the expected use of the soils is the same. Included with these soils in mapping are a few small areas of severely eroded and very shallow soils.

These soils have moderately rapid to rapid permeability and low to very low available water capacity. Where unlimed, they are strongly acid to very strongly acid. Runoff is rapid. The rooting depth is restricted by the depth to bedrock.

These soils have very poor potential for farming and are used mainly for woodland. They have fair potential for permanent pasture and woodland. They have poor potential for most nonfarm uses.

These soils are not suited to cultivated crops, because of slopes and the very severe hazard of erosion. Further erosion will result in a shallower rooting depth and lower available water capacity.

If the soils are used for permanent pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, the level of soil fertility needs to be maintained through periodic applications of nutrients.

A very large acreage of this association is in woodland. Productivity is fair to good for trees. Rooting depth is restricted by the depth to bedrock. A management problem is a moderate to heavy loss of seedlings due to the very low to low available water capacity and the high percentage of shale fragments in the subsoil. Slopes also limit the use of machinery. Logging roads should be constructed on the contour to prevent erosion during harvesting.

These soils have limitations for nonfarm uses because of the depth to bedrock, slope, very low available water capacity, and coarse fragments. The restricted depth to bedrock and slope may be a problem in excavating for buildings and are limitations for onsite waste disposal. If these soils are disturbed for construction, management practices will be needed to control erosion.

The minor soils included in mapping are more severely limited in use and management than the major soils. Capability subclass VIIe.

BrA—Brinkerton silt loam, 0 to 3 percent slopes. This nearly level, poorly drained soil is in depressions at the base of foot slopes. Slopes are 400 to 1,000 feet in length and are generally smooth and slightly concave. The areas are irregular in shape and range from 2 to 4 acres or more in size.

In a typical profile the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 38 inches thick. It is grayish brown, firm silty clay loam in the upper 9 inches, and it is gray, firm and brittle silty clay loam in the lower 29 inches. The substratum to a depth of 65 inches is gray, firm silty clay loam.

Included with this soil in mapping are small areas of moderately well drained Ernest soils. A few scattered areas of some very wet soils with a black, silty clay loam surface layer are also included.

This soil has slow permeability and moderate available water capacity. Runoff is medium. A water table is within 6 inches of the surface for long periods during wet seasons. The rooting depth is restricted by the high water table and the fragipan in the subsoil. In unlimed areas, the soil is medium acid to very strongly acid in the surface layer and subsoil.

Most of the acreage of this soil is used for permanent pasture. A few small areas are in woodland. This soil has poor potential for farming. It is best suited to permanent pasture and woodland. It has good potential for growing trees and poor potential for many nonfarm uses.

When this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in the spring and severely reduces the production of cultivated crops. Open drains and covered drains are needed to remove excess water.

The soil has fair potential for permanent pasture. Overgrazing and grazing of pasture on this soil when it is wet are the major management concerns. If the pasture is grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small acreage is wooded. Pruning of undesirable trees increases production. Use of equipment is restricted during wet seasons because of the high water table. Machine planting of trees is practical in the larger areas.

This soil has a severe limitation for most nonfarm uses because it is slowly permeable and has a fragipan. Pollution of ground water is a hazard if the soil is used for onsite disposal of waste. Wetness caused by the seasonal high water table is a hazard for buildings with basements. If buildings with basements are constructed in this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements. Capability subclass IVw.

BrB—Brinkerton silt loam, 3 to 8 percent slopes. This deep, poorly drained, gently sloping soil is on the sides of foot slopes of the uplands. The areas are irregular in shape and normally range from 2 to 4 acres or more in size.

In a typical profile, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of 45 inches. The upper 9 inches is grayish brown, firm silty clay loam; and the lower 29 inches is light brownish gray, firm and brittle, silty clay loam. The substratum to a depth of 65 inches is gray, firm silty clay loam.

Included with this soil in mapping are small areas of moderately well drained Ernest soils and soils with similar drainage that have bedrock within 40 inches of the surface.

This soil is slowly permeable, and the available water capacity is moderate. Reaction is medium acid to very strongly acid in the surface layer and subsoil where the soil is unlimed. A high water table is within 6 inches of the surface for much of the year. Runoff is medium. The rooting depth is restricted by the high water table and the fragipan.

Most areas of this soil are used for permanent pasture. If properly drained, this soil can be used occasionally for cultivated crops. It has good potential for growing trees. The high water table and slow permeability limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Excess water causes the soil to warm slowly in spring, and crops may be damaged by surface ponding following intensive rainfall. Excess water can be drained away by keeping natural drainageways open and by installing open drains and tile drains where outlets are available.

The soil has fair potential for permanent pasture. Grazing the pasture when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a selection of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees, and a small acreage is wooded. Potential productivity is good, but the rooting depth is restricted by the high water table and fragipan. Use of equipment is restricted for much of the year because of wetness resulting from the high water table. Machine planting of trees in large areas is practical.

This soil has limitations for most nonfarm uses because of the high water table and slow permeability. It has some potential for wildlife and recreational uses.

The included Ernest soil has similar limitations to use and management. Capability subclass IVw.

BuB—Buchanan gravelly loam, 3 to 8 percent slopes. This gently sloping, moderately well drained to somewhat poorly drained soil is on foot slopes of ridges. Slopes are smooth and concave. The areas are irregular in shape and range from 2 to 20 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 7 inches thick. The subsoil is about 53 inches thick. It is yellowish brown, friable gravelly silt loam in the upper 8 inches; strong brown, mottled gravelly silt loam in the next 6 inches, and strong brown, mottled, firm and brittle, gravelly silt loam in the lower 39 inches. Bedrock is at a depth below 60 inches.

Included with this soil in mapping are small areas of poorly drained Andover soils and well drained Laidig soils. A few scattered areas of gently sloping Buchanan soils are also included.

This soil has slow permeability and moderate available water capacity. Runoff is medium. The subsoil has a slowly permeable fragipan. This soil has a water table at a depth of 10 to 36 inches for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas, the soil is strongly acid to extremely acid throughout.

Most of the acreage of this soil is used for general farm crops. A few small areas are used for pasture and homesites. This soil has good potential for farming. It is best suited to grass and pasture but can be used for cultivated crops if properly managed. It has good potential for growing trees. It has limited potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Minimum tillage, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to help remove excess water and allow for timely tillage. The gravelly surface layer may interfere with the seeding and harvesting of some crops.

The soil has good potential for pasture. Overgrazing and grazing when wet are major management concerns. If the pasture is grazed when wet, the surface layer becomes compacted. Management should include proper stocking rates to maintain a balance of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods. For optimum production, the level of fertility needs to be maintained through periodic applications of nutrients.

The soil is suited to trees; a very small acreage is wooded. Pruning of undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil has limitations for most nonfarm uses because it is slowly permeable and has a seasonal high water table. There is a hazard of ground-water pollution if the soil is used for onsite disposal of waste. Wetness is a potential hazard for buildings with basements when they are constructed in this soil. Foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Andover soils included in mapping are more severely limited for most uses than the Buchanan soil. Capability subclass IIe.

BuC—Buchanan gravelly loam, 8 to 15 percent slopes. This sloping, moderately well drained to somewhat poorly drained soil is on the foot slopes and side slopes of the upland hills and ridges. Slopes are generally smooth and concave and are 400 to 1,000 feet in length. The areas are irregular in shape and about 2 to 20 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The subsurface layer is yellowish brown, friable gravelly loam about 5 inches thick. The subsoil extends to a depth of 60 inches. It is yellowish brown, friable gravelly silt loam in the upper 5 inches; the next 6 inches is strong brown, mottled gravelly silt loam; and the lower 39 inches is strong brown, mottled, firm and brittle gravelly loam. Bedrock is below a depth of 60 inches.

Included with this soil in mapping are a few areas of poorly drained Andover soils and well drained Laidig soils.

This soil has slow permeability and a moderate available water capacity. Runoff is medium. The subsoil has a slowly permeable fragipan. A water table is at a depth of 10 to 36 inches for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas the soil is strongly acid to extremely acid throughout.

Most areas of this soil are used for general farm crops. A few areas are used for pasture and homesites. The soil is best suited to grass and pasture but can be used for cultivated crops if properly managed. It has good potential for growing trees and limited potential for many nonfarm uses.

When this soil is used for cultivated crops, there is a severe hazard of erosion. Contour stripcropping, minimum tillage, sod waterways, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to remove excess water and allow for timely tillage. The gravelly surface layer may interfere with the seeding and harvesting of some crops.

The soil has a good potential for pasture. Overgrazing and grazing when wet are major management concerns. If the pasture is grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a selection of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small acreage is wooded, and some of the idle once-cultivated areas are reverting to trees. Pruning of undesirable trees increases production. Logging roads should be constructed on the contour to reduce erosion at harvest time. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because of slope, slow permeability, and a seasonal high water table. Because of slow permeability and the seasonal high water table there is a danger of ground water pollution if this soil is used for onsite disposal of waste. Wetness is a hazard for buildings with basements when they are constructed in this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The included Andover soils have more severe limitations for most uses than the Buchanan soil. Capability subclass IIIe.

BxB—Buchanan extremely stony loam, 3 to 8 percent slopes. This gently sloping, extremely stony, moderately well drained to somewhat poorly drained soil is on benches, foot slopes, and side slopes of upland hills and ridges. Slopes are generally smooth and concave and are 400 to 1,000 feet in length. The areas are irregular in shape and about 2 to 20 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 4 inches thick. The subsur-

face layer is yellowish brown, friable gravelly loam, 6 inches thick. The subsoil extends to a depth of about 60 inches. It is yellowish brown, friable gravelly silt loam in the upper 8 inches; the next 6 inches is strong brown, mottled gravelly silt loam; and the lower 36 inches is strong brown, mottled, firm and brittle, gravelly silt loam. Bedrock is below a depth of 60 inches.

Included with this soil in mapping are a few areas of poorly drained Andover soils and well drained Laidig soils.

This soil has slow permeability and moderate available water capacity. Runoff is medium. The subsoil has a slowly permeable fragipan. A water table is at a depth of 10 to 36 inches for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas, the soil is strongly acid to extremely acid throughout.

Most areas of this soil are used for woodland, and a few areas are used for pasture. The soil is too stony to use for cultivated crops, and it is poorly suited to grass and pasture. It has good potential for growing trees and limited potential for many nonfarm uses.

This soil is not suited to cultivated crops or to pasture because of the numerous surface stones and the seasonal high water table. It is not feasible to remove surface stones and lower the water table for crops or pasture because of the expense involved.

The soil is suited to trees. Most areas are wooded. Productivity is good. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Also, large surface stones interfere with seeding and harvesting.

This soil is limited for most nonfarm uses because of slow permeability, stony surface, and a seasonal high water table. Because of these limitations, there is a danger of ground-water pollution if this soil is used for onsite disposal of waste. Wetness is a hazard for buildings with basements when they are constructed in this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Andover soils included in mapping have more limitations to use and management than the Buchanan soils. The Laidig soils do not have wetness problems. Capability subclass VIIs.

BxD—Buchanan extremely stony loam, 8 to 15 percent slopes. This sloping, extremely stony, moderately well drained to somewhat poorly drained soil is on foot slopes and side slopes of the upland hills and ridges. Slopes are generally smooth and concave and are 400 to 1,000 feet in length. The areas are irregular in shape and range from about 2 to 90 acres in size.

In a typical profile the surface layer is very dark grayish brown gravelly loam about 3 inches thick. The subsurface layer is yellowish brown, friable gravelly loam 7 inches thick. The subsoil, is about 50 inches thick. It is yellowish brown, friable gravelly silt loam in the upper 8 inches; the next 6 inches is strong brown, mottled gravelly silt loam; and the lower 36 inches is strong brown, mottled, firm and brittle gravelly silt loam. Bedrock is below a depth of 60 inches.

Included with this soil in mapping are a few areas of poorly drained Andover soils and well drained Laidig soils.

This soil has slow permeability and moderate available water capacity. Runoff is rapid. The subsoil has a slowly permeable fragipan. A water table is at a depth of 10 to 36 inches for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas, the soil is strongly acid to extremely acid throughout.

Most areas of this soil are used for woodland and a few areas are in pasture. The soil is too stony to use for cultivated crops, and it is poorly suited to grass and pasture. It has good potential for growing trees and limited potential for many nonfarm uses.

This soil is not suited to cultivated crops or to pasture because of the numerous surface stones and the seasonal high water table. It is not feasible to remove surface stones and lower the water table for crops or pasture because of the expense involved.

The soil is suited to trees. Most areas are wooded, and productivity is good. Pruning undesirable trees increases production. Logging roads should be constructed on the contour to reduce erosion at harvest time. Use of equipment is restricted during wet seasons because of the seasonal high water table. Also, large surface stones interfere with seeding and harvesting.

This soil is limited for most nonfarm uses because it is sloping, slowly permeable, and extremely stony and has a seasonal high water table. Because of the slow permeability and the seasonal high water table, there is a danger of ground-water pollution if this soil is used for onsite disposal of waste. Wetness is a hazard for buildings with basements; foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Andover soils included in mapping have more limitations to use and management than the Buchanan soils. The Laidig soils do not have wetness problems. Capability subclass VIIs.

CaB—Chavies loam, 2 to 8 percent slopes. This nearly level to gently sloping, deep, well drained soil is on high bottoms and stream terraces. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 5 acres in size.

In a typical profile the surface layer is dark brown loam about 10 inches thick. The subsoil extends to a depth of 40 inches and is reddish brown, friable fine sandy loam. The substratum, to a depth of 76 inches, is strong brown, friable, gravelly fine sandy loam.

Included with this soil in mapping are a few areas of moderately well drained Monongahela soils.

This soil has moderately rapid permeability and moderate to high available water capacity. Runoff is slow. In areas that are not limed, the soil is strongly acid to medium acid throughout.

Most of the acreage of this soil is farmed; some small areas are used as woodland. The soil has good potential for farming, and it is also suited to pasture and trees. It has poor potential for use as homesites but is suited to most other nonfarm uses.

If this soil is used for cultivated crops there is a moderate hazard of erosion. Crops respond well to fertilizer and other management practices. Growing cover crops, using crop residue, and including hay in the cropping system are practices that help maintain the organic-matter content and good tilth. Minimum tillage, diversions, use of cover crops, including grasses and legumes in the cropping system, and stripcropping, where the topography is suitable, are practices that can be used to reduce runoff and control erosion.

If this soil is used for pasture, management should include rotation grazing and a proper stocking rate to help maintain a desirable balance of plants. For optimum production, the level of soil fertility needs to be maintained through periodic applications of nutrients.

This soil is suited to trees, but only a small acreage is wooded. Productivity is good. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses, such as homesites, because of rare flooding. Also, the stratified sand and gravel in the substratum may present problems for onsite sewage disposal.

There are additional limitations to the use and management of the included Monongahela soil. Capability subclass IIe.

EdB—Edom silty clay loam, 3 to 8 percent slopes. This gently sloping soil is on undulating dissected hills in upland valleys. Slopes are 400 to 1,000 feet in length. The areas are mainly irregular in shape and range from 2 to 30 acres in size.

In a typical profile of this soil in a cultivated area the surface layer is dark brown, friable silty clay loam 9 inches thick. The subsoil extends to a depth of 40 inches. In the upper 21 inches it is reddish brown, firm silty clay and clay; in the lower 10 inches it is yellowish brown, firm silty clay. The substratum is reddish brown, firm very shaly silty clay. Bedrock is at a depth of 60 inches.

Included in mapping are small areas of Opequon, Klinesville, Hagerstown, and Weikert soils. Also included are small areas of soils that are 20 to 40 inches deep to bedrock.

This well drained soil has moderate to moderately slow permeability and moderate available water capacity. Where it is not limed, it is neutral to medium acid in the surface layer and subsoil. Runoff is medium. Depth to bedrock ranges from 40 to 70 inches.

This soil has good potential for farming; it is used mainly for general farm crops. It has good potential for pasture and very good potential for woodland. Depth to bedrock is a limitation for some nonfarm uses that require deep excavation, and the heavy texture of the surface layer is a problem for other uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Some of the practices that help reduce runoff and control erosion are minimum tillage, use of cover crops, and including grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain the organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include rotation grazing and a proper stocking rate to help maintain a desirable selection of plants. For optimum production, the level of soil fertility must be maintained through periodic applications of nutrients. Grazing the pasture when the soil is wet can cause the surface layer to become compacted.

Small areas of this soil are wooded. Productivity is very good, but rooting depth is restricted by bedrock. Management problems for woodland uses are slight. Machine planting of trees in large areas is generally practical.

This soil is limited for some nonfarm uses by the shaly limestone bedrock at a depth of 40 to 70 inches and the heavy texture of the surface layer. If this soil is used for onsite disposal of waste, ground-water contamination can be a problem. If this soil is disturbed for construction, management practices may be needed to control erosion and sediment accumulation.

The Opequon, Klinesville, and Weikert soils included in mapping are shallow and have greater limitations to use and management than this Edom soil. The included Hagerstown soils have similar limitations to the Edom soils. Capability subclass IIe.

EdC—Edom silty clay loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are 2 to 30 acres in size.

In a typical profile the surface layer is dark brown, friable silty clay loam about 8 inches thick. The subsoil extends to a depth of 36 inches. The upper 9 inches is reddish brown, firm silty clay; the next 10 inches is reddish brown, firm clay; and the lower 9 inches is yellowish brown silty clay. The substratum is reddish brown very shaly silty clay. Limestone bedrock is at a depth of 46 inches.

Included with this soil in mapping are a few areas of shallow Opequon, Klinesville, and Weikert soils.

This soil has moderately slow to moderate permeability and moderate available water capacity. Runoff is medium. In unlimed areas, reaction is neutral to medium acid throughout the profile. Bedrock is at a depth of 40 to 70 inches.

Most of the acreage of this soil is farmed, and some small areas are used for pasture and woodland. The soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good, but the variable depth to bedrock and possible ground-water contamination may present problems for onsite waste disposal.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue and manure, and including hay in the cropping system are practices that maintain the organic-matter content and good tilth. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable selection of plants and rotation grazing. For optimum production, the level of fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is very good. Management problems are slight. Machine planting of trees is practical in the large areas. Logging roads should be constructed on the contour to reduce erosion during harvesting.

This soil is somewhat limited for nonfarm uses because of the variable depth to bedrock and the heavy surface layer textures. Possible ground-water contamination is a limitation for onsite sewage disposal.

The Opequon, Klinesville, and Weikert soils included in mapping are more limited in use and management than this Edom soil because they are shallow. Capability subclass IIIe.

EdD—Edom silty clay loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are 2 to 30 acres in size.

In a typical profile the surface layer is dark brown, friable shaly silt loam about 7 inches thick. The subsoil extends to a depth of 35 inches. The upper 9 inches is reddish brown, firm silty clay; the next 10 inches is reddish brown, firm clay; and the lower 9 inches is yellowish brown silty clay. The substratum to a depth of 46 inches is reddish brown very shaly silty clay.

Included with this soil in mapping are a few areas of shallow Opequon, Klinesville, and Weikert soils.

This soil has moderately slow to moderate permeability and moderate available water capacity. Runoff is rapid. In unlimed areas, the soil is neutral to medium acid throughout. Bedrock is at a depth of 40 to 70 inches.

Most of the acreage of this soil is farmed, but some small areas are used for pasture and woodland. This soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is poor, and there are limitations for most other nonfarm uses.

When this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue and manure, and including hay in the cropping system are practices that help maintain organic-matter content and good tilth. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good. Slope is a limitation to equipment operation, and roads should be constructed on the contour to control erosion at time of harvest. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the moderately steep slope and the variable depth to bedrock. Ground-water contamination is a hazard if this soil is used for onsite waste disposal.

The Opequon, Klinesville, and Weikert soils included in mapping are more limited in use and management because they are shallower. Capability subclass IVe.

EeB—Edom-Klinesville complex, 3 to 8 percent slopes. These deep and shallow, well drained, gently sloping soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are usually irregular in shape and range from 2 to 30 acres in size. The Edom soils make up about 50 percent of this complex, and the Klinesville soils make up 30 percent. The rest is minor soils.

In a typical profile, the Edom soils have a dark brown, friable silty clay loam surface layer about 6 inches thick. The subsoil extends to a depth of 36 inches. The upper 9 inches is reddish brown, firm silty clay; the next 10 inches is reddish brown clay; and the lower 11 inches is yellowish brown, silty clay. The substratum is reddish brown, firm, very shaly silty clay. Shaly limestone bedrock is at a depth of 46 inches.

The Klinesville soils typically have a dark reddish brown, friable shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 12 inches and is weak red, friable, shaly silt loam. The substratum is weak red, friable, very shaly silt loam. Shale bedrock is at a depth of 19 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded soils. Small areas of Opequon and Weikert soils are also included.

The soils of this complex have moderately slow to moderately rapid permeability and very low to moderate available water capacity. Where unlimed, they are very strongly acid to neutral. Runoff is medium. The rooting depth is restricted by the underlying shale bedrock.

These soils have good potential for farming and are used mainly for cultivated crops. They have good potential for pasture and woodland. The depth to bedrock and high content of coarse fragments are limitations for most nonfarm uses.

If these soils are used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes

in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue into the surface layer will help maintain organic matter content and reduce the tendency of the soils to clod and crust.

If these soils are used for pasture, management should include rotation grazing and a proper stocking rate to help maintain a desirable balance of plants. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

A small acreage of these soils is in woodland. Productivity is fair to good. The rooting depth is restricted by bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate available water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical.

These soils are limited for nonfarm uses because of the depth to bedrock and the high percentage of coarse fragments. The restricted depth to bedrock may be a problem in excavating for buildings, and ground-water pollution is possible if the soils are used for onsite waste disposal. If these soils are disturbed for construction, management practices may be needed to control erosion.

The Opequon and Weikert soils included in mapping have similar restrictions to use and management. Capability subclass IIe.

EeC—Edom-Klinesville complex, 8 to 15 percent slopes. These deep and shallow, well drained, sloping soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are usually irregular in shape and range from 2 to 20 acres in size. The Edom soils make up about 50 percent of this complex, and the Klinesville soils make up 30 percent. The rest is minor soils.

In a typical profile the Edom soils have a dark brown, friable silty clay loam surface layer about 6 inches thick. The subsoil extends to a depth of 36 inches. The upper 16 inches is reddish brown, firm shaly silty clay, and the lower 14 inches is yellowish brown, firm shaly silty clay. The substratum is reddish brown, firm very shaly silty clay. Shaly limestone bedrock is at a depth of 44 inches.

In a typical profile the Klinesville soils have a dark brown, friable shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 12 inches and is weak red, friable shaly silt loam. The substratum is weak red, friable, very shaly silt loam. Shale bedrock is at a depth of 19 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded soils. Small areas of Opequon and Weikert soils are also included.

These soils have moderately slow to moderately rapid permeability and very low to moderate available water capacity. Where unlimed, the soils are very strongly acid to neutral. Runoff is medium. The rooting depth is restricted by the underlying shale bedrock.

These soils have good potential for farming and are used mainly for farm crops. They have good potential for pasture and woodland. The depth to bedrock and high content of coarse fragments are limitations for most nonfarm uses.

If these soils are used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue into the surface layer helps maintain organic matter content and reduce the tendency of the soils to clod and crust.

If these soils are used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

A small acreage of these soils is in woodland. Productivity is fair to good. The rooting depth is restricted by shale bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical. Roads constructed during harvesting should be on the contour to reduce erosion.

These soils are limited for nonfarm uses by depth to bedrock, high content of coarse fragments, and very low available water capacity. The restricted depth to bedrock may be a problem in excavating for buildings. Ground-water contamination is a hazard if these soils are used for onsite waste disposal. If these soils are disturbed for construction, management practices may be needed to control erosion.

The Opequon and Weikert soils included in mapping have similar limitations to use and management. Capability subclass IIIe.

EeD—Edom-Klinesville complex, 15 to 25 percent slopes. These deep and shallow, well drained, moderately steep soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are mainly irregular in shape and range from 2 to 20 acres in size. The Edom soils make up about 50 percent of this complex, and the Klinesville soils make up 30 percent. The rest is minor soils.

In a typical profile the Edom soils have a dark brown, friable silty clay loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 14 inches is reddish brown, firm shaly silty clay, and the lower 14 inches is yellowish brown, firm shaly silty clay. The substratum is reddish brown, firm very shaly silty clay. Shaly limestone bedrock is at a depth of 44 inches.

In a typical profile the Klinesville soils have a dark reddish brown, friable shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 12 inches

and is weak red, friable shaly silt loam. The substratum is weak red, friable, very shaly silt loam. Shale bedrock is at a depth of 18 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded soils. Small areas of Opequon and Weikert soils are also included.

These soils have moderately slow to moderately rapid permeability and very low to moderate available water capacity. Where unlimed, they are very strongly acid to neutral. Runoff is rapid. The rooting depth is restricted by the underlying shale bedrock.

These soils have fair to good potential for farming and are used mainly for farm crops. They have good potential for pasture and woodland. The depth to bedrock, slope and high content of coarse fragments are limitations for most nonfarm uses.

If these soils are used for cultivated crops, the severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain organic-matter content and reduce the tendency of the soil to clod and crust.

If the soils are used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

A small acreage of these soils is in woodland. Productivity is fair to good, although rooting depth is restricted by the depth to shale bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate available water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical. Slope should be considered when equipment is selected. At harvest time, roads should be constructed on the contour to reduce erosion.

These soils are limited for nonfarm uses because of the depth to bedrock, high content of coarse fragments, and slope. The restricted depth to bedrock may be a problem in excavating for buildings, and it limits onsite waste disposal because of the possibility of ground-water contamination. If these soils are disturbed for construction, management practices are necessary to control erosion.

The Opequon and Weikert soils included in mapping have limitations to use and management similar to those of the Klinesville soils. Capability subclass IVe.

EfB—Edom-Weikert complex, 3 to 8 percent slopes. These deep and shallow, well drained, gently sloping soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are mostly irregular in shape and range from 2 to 30 acres in size. The Edom soils make up about 50 percent of this complex, and the Weikert soils make up 30 percent.

In a typical profile, the Edom soils have a dark brown, friable silty clay loam surface layer about 6 inches thick. The subsoil extends to a depth of 36 inches. The upper 9 inches is reddish brown, firm shaly silty clay; the next 10 inches is reddish brown clay; and the lower 11 inches is yellowish brown silty clay. The substratum is reddish brown, firm very shaly silty clay. Shaly limestone bedrock is at a depth of 46 inches.

In a typical profile, the Weikert soils have a dark brown shaly silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 14 inches and is yellowish brown, friable, very shaly silt loam. The substratum is yellowish brown, friable very shaly silt loam. Dark gray shale bedrock is at a depth of 18 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded and very shallow soils.

These soils have moderately slow to rapid permeability and very low to moderate available water capacity. Where unlimed, the soils are very strongly acid to neutral. Runoff is medium. The rooting depth is restricted by the underlying shale bedrock.

These soils have good potential for farming and are used mainly for crops. They have good potential for pasture and woodland. The depth to bedrock and high content of coarse fragments are limitations for most nonfarm uses.

If these soils are used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain organic-matter content and reduce the tendency of the soil to clod and crust.

A small acreage of these soils is in woodland and productivity is fair to good. Rooting depth is restricted by the depth to the shale bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical.

These soils are limited for nonfarm uses because of the depth to bedrock and high content of coarse fragments. The restricted depth to bedrock may be a problem in excavating for buildings. Ground water contamination is a hazard if the soils are used for onsite waste disposal. If they are disturbed for construction, management practices may be needed to control erosion.

The minor soils included in mapping are similarly restricted in use and management. Capability subclass IIe.

EfC—Edom-Weikert complex, 8 to 15 percent slopes. These deep and shallow, well drained, sloping soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and range from 2 to 30 acres in size. The Edom soils make up about 50 percent of this complex, and the Weikert soils make up 35 percent. The rest is minor soils.

In a typical profile the Edom soils have a dark brown, friable shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 36 inches. The upper 9 inches is reddish brown, firm shaly silty clay; the next 10 inches is reddish brown clay; and the lower 11 inches is yellowish brown silty clay. The substratum is reddish brown, firm very shaly silty clay. Shaly limestone bedrock is at a depth of 46 inches.

In a typical profile the Weikert soils have a dark brown shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 14 inches and is yellowish brown, friable very shaly silt loam. The substratum is yellowish brown, friable very shaly silt loam. Dark gray shaly bedrock is at a depth of 18 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded and very shallow soils.

These soils have moderately slow to rapid permeability and very low to moderate available water capacity. Where unlimed, they are very strongly acid to neutral. Runoff is medium. The rooting depth is restricted by the underlying shale bedrock.

These soils have good potential for farming and are used mainly for crops. They have good potential for pasture and woodland and are limited for most nonfarm uses.

If these soils are used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain organic matter content and reduce the tendency of the soils to clod and crust.

If these soils are used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

A small acreage of these soils is in woodland, and productivity is fair to good. The rooting depth is restricted by the shale bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical. Roads constructed during harvesting should be on the contour to reduce erosion.

These soils are limited for nonfarm uses because of the depth to bedrock, slope, and high content of coarse fragments. The restricted depth to bedrock may be a problem in excavating for buildings. Ground-water contamination is a hazard if the soils are used for onsite waste disposal. If these soils are disturbed for construction, management practices are necessary to control erosion.

The minor soils included in mapping have similar limitations to use and management. Capability subclass IIIe.

EfD—Edom-Weikert complex, 15 to 25 percent slopes. These deep and shallow, well drained, moderately steep soils are on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are usually irregular in shape and range from 2 to 30 acres in size. The Edom soils make up about 50 percent of this complex, and the Weikert soils make up 30 percent. The rest is minor soils.

In a typical profile the Edom soils have a dark brown, friable shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 14 inches is reddish brown, firm shaly silty clay; and the lower 14 inches is yellowish brown, firm shaly silty clay. The substratum is reddish brown, firm, very shaly silty clay. Shaly limestone bedrock is at a depth of 44 inches.

In a typical profile the Weikert soils have a dark brown shaly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 12 inches and is yellowish brown, friable, very shaly silt loam. The substratum is yellowish brown, friable very shaly silt loam. Dark gray shaly bedrock is at a depth of 18 inches.

These soils are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with these soils in mapping are a few small areas of severely eroded and very shallow soils.

These soils have moderately slow to rapid permeability and very low to moderate available water capacity. Where unlimed, they are very strongly acid to neutral. Runoff is rapid. The rooting depth may be restricted by the depth to the underlying shale bedrock.

These soils have fair to good potential for farming and are used mainly for grass and pasture. They have good potential for pasture and woodland and are limited for most nonfarm uses.

If these soils are used for cultivated crops, the severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and use of grass and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue and manure into the surface layer helps maintain organic matter content and reduce the tendency of the soils to clod and crust.

When these soils are used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum

production, soil fertility needs to be maintained through periodic applications of nutrients.

A small acreage of these soils is in woodland. Productivity is fair to good, although the rooting depth may be restricted by shale bedrock. There is a moderate to heavy loss of seedlings due to the very low to moderate water capacity and the high percentage of shale fragments in the subsoil. Machine planting of trees in large areas is generally practical. Slope should be considered when equipment is selected. Harvesting roads should be constructed on the contour to reduce erosion.

These soils are limited for nonfarm uses because of the depth to bedrock, slope, and high content of coarse fragments. The restricted depths to bedrock may be a problem in excavating for buildings. Ground-water contamination is a hazard if these soils are used for onsite waste disposal. If these soils are disturbed for construction, management practices are needed to control erosion.

The minor soils included in mapping have similar limitations to use and management. Capability subclass IVe.

ElB—Elliber very cherty loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on ridgetops and upper side slopes. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are generally 2 to 5 acres in size.

In a typical profile the surface layer is very dark grayish brown very cherty loam about 8 inches thick. The subsurface layer is 7 inches of pale brown, friable very cherty loam. The subsoil extends to a depth of 63 inches. The upper 12 inches is light yellowish brown, friable very cherty loam; the next 15 inches is reddish yellow, firm very cherty silt loam; and the lower 21 inches is strong brown, firm very cherty silt loam. The substratum to a depth of 71 inches is strong brown, firm, very cherty silt loam.

Included with this soil in mapping are a few areas of well drained Mertz and moderately well drained Kreamer soils and scattered areas of Elliber soils that have fewer than 50 percent chert fragments in the surface layer.

This soil has moderately rapid permeability and moderate available water capacity. Runoff is slow. The soil has more than 50 percent chert fragments in the surface layer. In unlimed areas, it is very strongly acid to strongly acid.

Most of the acreage of this soil is farmed. This soil has good potential for farming, and it is suited to pasture and trees. The potential for use as homesites is good, but the high content of coarse fragments is a limitation for many other nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system maintain the organic-matter content and good tilth of the soil. The cherty surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

If this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, and a moderate acreage is wooded. Productivity is very good. Management problems are mostly slight. Machine planting of trees is practical in the large areas, although the chert fragments interfere with seeding.

This soil is somewhat limited for nonfarm uses by the high content of chert fragments. There is a possibility of ground-water contamination if this soil is used for onsite waste disposal.

The Mertz soils included in mapping have similar problems in use and management to those of the Elliber soil. The Kreamer soils have more severe problems related to a seasonal high water table. Capability subclass IIIs.

ElC—Elliber very cherty loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on the sides of cherty ridges of the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 5 to 40 acres in size.

In a typical profile the surface layer is very dark grayish brown, very cherty loam about 8 inches thick. The subsurface layer is 7 inches of pale brown very cherty loam. The subsoil extends to a depth of 61 inches. The upper 10 inches is light yellowish brown, friable very cherty loam; the next 15 inches is reddish yellow, firm very cherty silt loam; and the lower 21 inches is strong brown very cherty silt loam. The substratum to a depth of 71 inches is strong brown, firm, very cherty silt loam.

Included with this soil in mapping are a few areas of well drained Mertz and moderately well drained Kreamer soils and scattered areas of Elliber soils that have a cherty silt loam surface layer.

This soil has moderately rapid permeability and moderate available water capacity. Runoff is medium. The surface layer is more than 50 percent chert fragments. In unlimed areas, the soil is very strongly acid to strongly acid throughout.

Most of the acreage of this soil is farmed. This soil has fair potential for farming, and it is suited to pasture and trees. The potential for use as homesites is fair, but the high content of chert and slope are limitations for many other nonfarm uses.

If this soil is used for cultivated crops there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system maintain the organic-matter content and good tilth of the soil. Minimum tillage, diversions, cover crops, and stripcropping where the topography is suitable are practices that can be used to reduce erosion. The very cherty surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable selection of plants, and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, and a moderate acreage is wooded. Productivity is very good. Management problems are mostly moderate. Logging roads should be constructed on the contour to reduce erosion at harvest time. Machine planting trees is practical in the large areas, although the chert fragments interfere with seeding.

This soil is somewhat limited for nonfarm uses because of slope and the high content of coarse fragments. If this soil is used for waste disposal there is a possibility of contamination of ground water.

The Mertz soils included in mapping have similar limitations to use and management to the Elliber soils. The Kreamer soils have more severe problems related to a seasonal high water table. Capability subclass IVs.

ElD—Elliber very cherty loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on the sides of cherty ridges of the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 5 to 40 acres in size.

In a typical profile the surface layer is very dark grayish brown very cherty loam about 8 inches thick. The subsurface layer is 7 inches of pale brown very cherty loam. The subsoil extends to a depth of 61 inches. The upper 10 inches is light yellowish brown, friable very cherty loam; the next 15 inches is reddish yellow, firm very cherty silt loam; and the lower 21 inches is strong brown very cherty silt loam. The substratum to a depth of 71 inches is strong brown, firm, very cherty silt loam.

Included with this soil in mapping are a few areas of well drained Mertz and moderately well drained Kreamer soils and scattered areas of Elliber soils that have a cherty silt loam surface layer.

This soil has moderately rapid permeability and moderate available water capacity. Runoff is rapid. The surface layer is more than 50 percent chert fragments. In unlimed areas, the soil is very strongly acid to strongly acid throughout.

Most of the acreage of this soil is farmed, and small areas are used for woodland. This soil has good potential for farming, and it is suited to pasture and trees. The potential for homesites is fair to poor, and there are limitations for many nonfarm uses.

This soil is very cherty and moderately steep. It is not suited to cultivated crops because of the slope and high erosion hazard.

If this soil is used for pasture, management should include proper stocking rates to maintain desirable plants and rotation grazing. For optimum production, nutrients need to be applied periodically to maintain fertility.

The soil is suited to trees, and a moderate acreage is wooded. Productivity is good. Logging roads should be constructed on the contour to reduce erosion during harvesting. Slope should be considered in equipment selection. Machine planting of trees is practical in the large areas, although the slope and chert fragments interfere with seeding.

The soil is somewhat limited for nonfarm uses by slope and the high coarse fragment content. There is a strong possibility of ground-water contamination if this soil is used for onsite waste disposal.

The Mertz soils included in mapping have similar problems in use and management to those of the Elliber soil. The Kreamer soils have more severe problems related to a seasonal high water table. Capability subclass VIs.

ElF—Elliber very cherty loam, 25 to 60 percent slopes. This steep to very steep, deep, well drained soil is on sides of cherty ridges of the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 5 to 40 acres in size.

In a typical profile the surface layer is very dark grayish brown very cherty loam about 6 inches thick. The subsurface layer is 6 inches of pale brown very cherty loam. The subsoil extends to a depth of 60 inches. The upper 10 inches is light yellowish brown, friable very cherty loam; the next 15 inches is reddish yellow, firm very cherty silt loam; and the lower 23 inches is strong brown very cherty silt loam. The substratum to a depth of 70 inches is strong brown, firm very cherty silt loam.

Included with this soil in mapping are a few areas of well drained Mertz soils and scattered areas of Elliber soils that have a cherty silt loam surface layer.

This soil has moderately rapid permeability and moderate available water capacity. Runoff is very rapid. The surface layer is more than 50 percent chert fragments. In unlimed areas the soil is very strongly acid to strongly acid throughout.

Most of the acreage of this soil is in woodland. This soil has very poor potential for farming. It is better suited to trees. The potential for nonfarm uses is very poor.

The soil is too steep for cultivated crops, and the high percentage of chert fragments and slope limit its use for pasture.

The soil is suited to trees, and nearly all of the acreage is wooded. Productivity is good. The steep slope presents problems in equipment selection and makes machine planting impractical. Roads used during harvesting should be constructed on the contour to reduce erosion.

The soil is limited for nonfarm uses by slope and the high percentage of coarse fragments. Slope is a serious limitation to use of the soil as homesites and for onsite waste disposal. These are similar limitations to the use and management of the included Mertz and Elliber soils. Capability subclass VIIs.

ErB—Ernest silt loam, 2 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on benches and foot slopes of shale ridges. Slopes are generally 400 to 1,000 feet in length and are mainly smooth and concave. The areas are irregular in shape and range from 2 to 4 acres or more in size.

In a typical profile the surface layer is dark brown, very friable silt loam about 10 inches thick. The subsoil extends to a depth of about 50 inches. It is yellowish brown, friable silty clay loam in the upper 6 inches; yellowish brown, firm silty clay loam in the next 8 inches; and yellowish brown, firm and brittle silty clay loam in the lower 26 inches. The substratum to a depth of 70 inches is brown, firm silty clay loam.

Included with this soil in mapping are small areas of well drained Berks soils. A few scattered areas of poorly drained Brinkerton soils are also included.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. A water table is at a depth of 18 to 36 inches for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas, the soil is strongly acid to very strongly acid throughout.

Most of the acreage of this soil is used for general farm crops. A few small areas are in woodland. The soil has good potential for farming, and it is best suited to general farm crops. It has good potential for growing trees. The seasonal high water table and moderately slow to slow permeability limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Minimum tillage, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to help remove excess water and allow timely tillage. Cover crops and stripcropping, where the topography is suitable, are practices that can be used to control erosion.

The soil has good potential for pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet the surface layer becomes compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees, and moderate acreage is wooded. The rooting depth is restricted by the fragipan. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it has moderately slow to slow permeability and a seasonal high water table. There is a possibility of ground-water pollution if this soil is used for the onsite disposal of waste. Wetness is a hazard for buildings with subsurface basements, and foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Berks soils included in mapping are limited in use because they are only moderately deep and the Brinkerton soils are more severely limited by wetness. Capability subclass IIe.

ErC—Ernest silt loam, 8 to 15 percent slopes. This sloping, moderately well drained soil is on the upper foot slopes of shale ridges. Slopes are generally 400 to 1,000 feet in length and are smooth and concave. The areas are irregular in shape and about 2 to 4 acres or more in size.

In a typical profile the surface layer is dark brown, very friable silt loam about 10 inches thick. The subsoil extends to a depth of about 40 inches. It is yellowish brown, friable silty clay loam in the upper 6 inches; the next 8 inches is yellowish brown, firm silty clay loam; and the lower 16 inches is yellowish brown, firm and brittle silty clay loam. The substratum to a depth of 60 inches is brown, firm, silty clay loam.

Included with this soil in mapping are a few areas of well drained Berks soil and a few scattered areas of poorly drained Brinkerton soils.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. The subsoil has a firm and brittle fragipan. A water table is at a depth of 18 to 36 inches for long periods during wet seasons. Rooting depth is restricted by the fragipan. In unlimed areas the soil is strongly acid to very strongly acid throughout.

Most areas of this soil are used for general farm crops. A few areas are in woodland. The soil is best suited to grass and pasture, but it can be used for crops if properly managed. It has good potential for growing trees. The seasonal high water table, slowly permeable subsoil, and slope limit its potential for many nonfarm uses.

When this soil is used for cultivated crops, there is a severe hazard of erosion. Contour stripcropping, minimum tillage, sod waterways, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to remove excess water and allow for timely tillage.

The soil has good potential for pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small area is naturally wooded, and many of the once-cultivated idle acres are reverting to trees. Pruning undesirable species increases production. Logging roads should be constructed on the contour to reduce erosion during harvesting. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it is slowly permeable and has a seasonal high water table. Pollution of ground water is a possibility if the soil is used for onsite disposal of waste. Wetness is a hazard for buildings with subsurface basements; and foundation drains with proper outlets should be used to prevent seepage of water into such basements.

The Brinkerton soils included in this unit have more severe limitations to use and management than the Er-

nest soils. The included Berks soils are limited by moderate depth to bedrock. Capability subclass IIIe.

Ev—Evendale cherty silt loam. This deep, somewhat poorly drained, nearly level to gently sloping soil is on lower foot slopes below chert ridges. Slopes are generally smooth and concave and are mainly 400 to 1,000 feet in length. The areas are irregular in shape and about 2 to 30 acres in size.

In a typical profile the surface layer is dark brown cherty silt loam about 7 inches thick. The subsurface layer is 4 inches of pale brown silty clay loam. The subsoil extends to a depth of 60 inches. The upper 7 inches is light brownish gray, firm clay; the next 15 inches is brownish yellow, firm cherty clay; and the lower 27 inches is light gray, firm cherty clay.

Included with this soil in mapping are a few areas of moderately well drained Kreamer soils and a few areas of a soil having browner colors in the lower part of the subsoil. Also included are scattered areas of wetter soils.

This soil has slow permeability and high available water capacity. Runoff is medium. The subsoil has a high clay content. A water table is at a depth of 6 to 18 inches for long periods during wet seasons. The rooting depth is restricted by the seasonal high water table. In unlimed areas, the soil is neutral to strongly acid in the surface layer and upper part of the subsoil and very strongly acid to strongly acid in the lower part of the subsoil.

Most areas of this soil are in permanent pasture. A few areas are in woodland. This soil is best suited to grass, woodland, and pasture but can be used for crops if properly managed. It has good potential for growing trees. The seasonal high water table and slowly permeable subsoil limit its potential for many nonfarm uses.

If this soil is used for cultivated crops there is a slight to moderate hazard of erosion. Stripcropping on the gently sloping areas, minimum tillage, sod waterways, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to remove excess water and allow for timely tillage. The chert fragments may interfere with the seeding and harvesting of some crops.

The soil has good potential for permanent pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer becomes compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferment of grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. Small areas are naturally wooded, and many of the once-cultivated idle acres are reverting to trees. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil has limitations for most nonfarm uses because it is slowly permeable and has a seasonal high water table. There is a possibility of ground-water pollution if this soil is used for onsite disposal of waste. Wetness is a hazard if it is used for buildings with subsurface basements; therefore, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

Most of the soils included in mapping have similar problems in use and management. Capability subclass IIIw.

HaB—Hagerstown silt loam, 2 to 8 percent slopes. This nearly level to gently sloping, deep, well drained soil is in the limestone valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are 2 to 40 acres in size.

A typical profile in a cultivated area of this soil has a surface layer of dark yellowish brown silt loam 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 6 inches is strong brown, firm silt loam; the next 4 inches is strong brown, firm silty clay loam; the next 22 inches is yellowish red, firm silty clay; and the lower 20 inches is yellowish red, firm silty clay loam.

Included with this soil in mapping are a few small areas of shallow Opequon soils and small scattered areas of Nolin soils.

This soil has moderate permeability and moderate to high available water capacity. Runoff is moderate. In unlimed areas, the soil is medium acid to neutral.

Most areas of this soil are cultivated, and very small areas are used for woodland. This soil has excellent potential for farming, and it is well suited to pasture and trees. The potential for homesites and most other nonfarm uses is good.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, and including hay in the cropping system maintain the organic-matter content and good tilth of the soil.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is excellent. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil has few limitations for most nonfarm uses. Sinkholes may limit its use for building, and there is a possibility of ground-water contamination if the soil is used for onsite waste disposal.

Additional limitations to the use and management of the included Opequon and Nolin soils. Capability subclass IIe.

HcB—Hagerstown silty clay loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is in the limestone valleys. Slopes are generally 400 to 1,000

feet in length. The areas are irregular in shape and are mainly 2 to 20 acres in size.

A typical profile in a cultivated area has a surface layer of dark yellowish brown, silty clay loam 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 10 inches is strong brown, firm silty clay loam; the lower 42 inches is yellowish red, firm silty clay.

Included with this soil in mapping are a few small areas of shallow Opequon soils and small scattered areas of Nolin soils.

This soil has moderate permeability and moderate available water capacity. Runoff is moderate. In unlimed areas the soil is medium acid to neutral.

Most areas of this soil are cultivated, and very small areas are used for woodland. The soil has excellent potential for farming, and it is well suited to pasture and trees. The potential for homesites is good, but there are limitations for other nonfarm uses.

When this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, and including hay in the cropping system are practices that maintain the organic matter content and good tilth of the soil.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is excellent. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for use as building sites because of the cavernous nature of the underlying bedrock. There is a possibility of ground-water contamination if this soil is used for onsite waste disposal. Heavy surface layer texture is a limitation for other nonfarm uses.

There are additional limitations to the use and management of the included Opequon and Nolin soils. Capability subclass IIe.

HcC—Hagerstown silty clay loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is in the limestone valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are mainly 2 to 30 acres in size.

In a typical profile in a cultivated area the surface layer is dark yellowish brown, silty clay loam 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 10 inches is strong brown, firm silty clay loam; the lower 42 inches is yellowish red, firm silty clay.

Included with this soil in mapping are a few small areas of shallow Opequon soils and small scattered areas of Nolin soils.

This soil has moderate permeability and moderate available water capacity. Runoff is moderate. In unlimed areas the soil is medium acid to neutral.

Most areas of this soil are cultivated, and very small areas are used for woodland. The soil has good potential for farming, and it is well suited to pasture and trees. The potential for homesites is fair, but the slope and heavy texture of the surface layer are limitations for most other nonfarm uses.

If this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, manure, and including hay in the cropping system maintain organic-matter content and good tilth.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. Grazing of pasture when this soil is wet will cause the surface layer to become compacted. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is excellent. Most management problems are slight. Logging roads should be constructed on the contour to reduce erosion at harvest time. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the slope and heavy texture of the surface layer. There is a possibility of ground-water contamination if this soil is used for onsite waste disposal. Sinkholes may present problems for building sites.

There are additional limitations to the use and management of the included Opequon and Nolin soils. Capability subclass IIIe.

HcD—Hagerstown silty clay loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is in the limestone valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are mainly 2 to 30 acres in size.

In a typical profile in a cultivated area the surface layer is dark yellowish brown silty clay loam 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 10 inches is strong brown, firm silty clay loam; the lower 42 inches is yellowish red, firm silty clay.

Included with this soil in mapping are a few small areas of shallow Opequon soils and small, scattered areas of rock outcrop.

This soil has moderate permeability and moderate available water capacity. Runoff is rapid. In unlimed areas, the soil is medium acid to neutral.

Most areas of this soil are cultivated, and very small areas are used for woodland. The soil has fair to good potential for farming, and it is well suited to pasture and trees. The potential for homesites is poor, and the potential for onsite waste disposal is poor.

If this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, and manure, and including hay in the cropping system are practices that help maintain organic-matter content and good tilth.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. Grazing of pasture when this soil is wet will cause the surface layer to become compacted. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is excellent. Logging roads should be constructed on the contour to reduce erosion during harvesting. Slope restricts equipment selection. Machine planting of trees is practical in large areas if slope does not prohibit the use of machinery.

This soil is limited for nonfarm uses because of the slope and heavy texture of the surface layer. Ground-water contamination is a possible hazard if this soil is used for onsite waste disposal.

There are additional limitations to the use and management of the included Opequon soils. Capability subclass IVe.

HeB—Hagerstown-Rock outcrop complex, 0 to 8 percent slopes. This complex of nearly level to gently sloping soils and Rock outcrop is on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and range from 2 to 5 acres in size. The Hagerstown soils make up about 50 percent of this complex, and Rock outcrop makes up 30 percent. The rest is minor soils.

In a typical profile, the Hagerstown soils have a dark yellowish brown, silty clay loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 10 inches is strong brown, firm silty clay loam; the lower 42 inches is yellowish red, firm silty clay.

Rock outcrop consists of solid limestone protrusions.

The Hagerstown soils and Rock outcrop are mapped together because they occur together in such intricate patterns that it was not practical to map them separately. Included with this unit in mapping are a few small areas of shallow Opequon soils.

The Hagerstown soils have moderate permeability and moderate to high available water capacity. Where unlimed, the soil is medium acid to neutral. Runoff is moderate. The rooting depth may be restricted by bedrock.

This complex has poor potential for cultivated crops because of the rock outcrops. It is mainly used for permanent pasture. It has fair potential for pasture and good potential for woodland. It has poor potential for most nonfarm uses.

When this complex is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. Grazing of pasture when the soil is wet will cause the surface layer to become compacted. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

A small acreage of this complex is in woodland. Productivity is excellent on the Hagerstown part, but the overall production is reduced by the Rock outcrop. Rooting depth may be restricted by the depth to bedrock. Rock outcrop limits some use of equipment.

This complex is limited for nonfarm uses because of the rock outcrops, heavy texture of the surface layer, and depth to bedrock. The restricted depth to bedrock may be a problem in excavating for buildings. If the complex is used for onsite waste disposal, there is a possibility of ground-water contamination because of the cavernous nature of the underlying bedrock. If this complex is disturbed for construction, management practices may be needed to control erosion.

The Opequon soils included in mapping have more serious problems in use and management than the Hagerstown soils. Capability subclass VIe.

HeD—Hagerstown-Rock outcrop complex, 8 to 25 percent slopes. This complex of sloping to moderately steep soils and Rock outcrop is on undulating dissected hills in upland valleys. Slopes are generally 400 to 1,000 feet in length. The areas are mainly irregular in shape and range from 2 to 5 acres in size. The deep and well drained Hagerstown soils make up about 50 percent of this complex, and Rock outcrop makes up 30 percent. The rest is included minor soils.

In a typical profile the Hagerstown soils have a dark yellowish brown, silty clay loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 10 inches is strong brown, firm silty clay loam; and the lower 42 inches is yellowish red, firm silty clay.

Rock outcrop consists of solid limestone protrusions.

The Hagerstown soils and Rock outcrop are mapped together because they occur in such intricate patterns that it was not practical to map them separately. Included with this unit in mapping are a few small areas of shallow Opequon soils.

The Hagerstown part of this complex has moderate permeability and moderate to high available water capacity. Where unlimed, Hagerstown soils are medium acid to neutral. Runoff is rapid. The rooting depth may be restricted by the bedrock.

This complex has poor potential for cultivated crops, and it is used mainly for pasture. It has fair potential for pasture and good potential for woodland. The potential for most nonfarm uses is poor.

This complex is too rocky for cultivated crops. The numerous outcrops of rock make cultivation impractical.

If this complex is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. Grazing of pasture

when the soil is wet will cause the surface layer to become compacted. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

A small acreage of this complex is in woodland. Productivity is excellent on the Hagerstown part, but the overall production is reduced by the rock outcrops. The rooting depth may be restricted by bedrock. Rock outcrops and slope are limitations for equipment selection. Machine planting of trees is generally practical in large areas, although slope and rock outcrops interfere with planting.

This complex is limited for nonfarm uses because of the rock outcrops, slope, and heavy texture of the surface layer. Depth to bedrock is a problem in excavating for buildings in areas where bedrock is close to or at the surface. If this complex is used for onsite waste disposal, there is a possibility of ground-water contamination because of the cavernous nature of the underlying bedrock. If the soil is disturbed for construction, management practices are necessary to control erosion.

The Opequon soils included in mapping have more serious problems in use and management than the Hagerstown soils. Capability subclass VIs.

HhB—Hazleton channery loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on benches and along the sides of the high mountain ridges. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are 2 to 25 acres in size.

In a typical profile the surface layer is dark grayish brown channery loam about 7 inches thick. The subsoil extends to a depth of 40 inches. The upper 3 inches is dark brown, friable channery sandy loam; the lower 30 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable very channery coarse sandy loam.

Included with this soil in mapping are a few areas of well drained Morrison soils and scattered areas of well drained Vanderlip soils.

This soil has moderately rapid to rapid permeability and moderate to low available water capacity. Runoff is medium. The surface layer is 15 percent or more coarse fragments. In unlimed areas, the soil is strongly acid or very strongly acid throughout.

Most of the acreage of this soil is in row crops, and small areas are used for woodland. The soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good, although there are limitations to use of this soil for onsite waste disposal. The soil is good for most nonfarm uses, except those in which coarse fragments are a limitation.

If this soil is used for cultivated crops, the hazard of erosion is moderate. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system are practices that help maintain organic-matter content and good tilth. Diversions, cover crops, and stripcropping are practices that can be used to reduce erosion. The channery surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plant species and rotation of pastures. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, and some of the acreage is wooded. Productivity is good. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the channery surface layer. It has good potential for homesites, but the rapid permeability may present problems for onsite waste disposal.

There are similar limitations to the use and management of the included Morrison and Vanderlip soils. Capability subclass IIe.

HhC—Hazleton channery loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on the sides of the high mountain ridges. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are mainly 2 to 25 acres in size.

In a typical profile in a cultivated area, the surface layer is dark grayish brown channery loam about 7 inches thick. The subsoil extends to a depth of 38 inches. The upper 3 inches is dark brown, friable channery sandy loam; the lower 28 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable very channery coarse sandy loam.

Included with this soil in mapping are a few small areas of well drained Morrison soils and small, scattered areas of well drained Vanderlip soils.

This soil has moderately rapid to rapid permeability and moderate to low available water capacity. Runoff is medium. The surface layer is 15 percent or more coarse fragments. In unlimed areas the soil is strongly acid or very strongly acid throughout.

Most areas of this soil are in row crops, and small areas are used for woodland. The soil has good potential for farming, and it is suited to pasture and trees. The potential for homesites is fair, but there are limitations for most other nonfarm uses.

When this soil is used for cultivated crops, the hazard of erosion is moderate. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue and manure, and including hay in the cropping system are practices that help maintain organic-matter content and good tilth. The channery surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable balance of plants, and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, and some of the acreage is wooded. Productivity is good. Management problems are mostly slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the slope and coarse fragments. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

There are similar limitations to the use and management of the included Morrison and Vanderlip soils. Capability subclass IIIe.

HhD—Hazleton channery loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on the sides of the high mountain ridges. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and are mainly 2 to 25 acres in size.

In a typical profile in a wooded area the surface layer is black channery loam about 1 inch thick. The subsurface layer extends to a depth of 2 inches and is dark gray channery loam. The subsoil extends to a depth of 36 inches. The upper 2 inches is light reddish brown, friable channery loam; the next 2 inches is dark brown, friable channery sandy loam; and the lower 30 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable very channery coarse sandy loam.

Included with this soil in mapping are a few small areas of well drained Morrison soils and small, scattered areas of well drained Vanderlip soils.

This soil has moderately rapid to rapid permeability and moderate to low available water capacity. Runoff is medium. In unlimed areas the soil is strongly acid or very strongly acid throughout.

Most areas of this soil are in row crops, but small areas are used for woodland. The soil has fair potential for farming, and it is suited to pasture and trees. The potential for homesites is poor, and there are limitations for most other nonfarm uses.

When this soil is used for cultivated crops, the hazard of erosion is severe. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, and including hay in the cropping system are ways of maintaining the organic matter content and good tilth of the soil. The channery surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

If this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, and some of the acreage is wooded. Productivity is good. Slope is a limitation in equipment selection. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the slope and coarse fragment content. Slope is a serious limitation for onsite waste disposal. If this soil is disturbed for construction, management practices are needed to control erosion and sediment.

There are similar limitations to the use and management of the included Morrison and Vanderlip soils. Capability subclass IVe.

HSB—Hazleton-Dekalb extremely stony sandy loams, gently sloping. These deep and moderately deep, extremely stony, gently sloping soils are on benches along streambeds and on the sides of ridges. Slopes are generally 400 to 1,000 feet in length. The areas are mainly irregular in shape and range from 2 to 100 acres in size. The Hazleton soils make up more than 50 percent of most areas and the Dekalb soils less than 30 percent.

In a typical profile in a wooded area, the Hazleton soils have a black, channery sandy loam surface layer about 1 inch thick. This layer is underlain by a dark gray, friable channery sandy loam subsurface layer 1 inch thick. The subsoil extends to a depth of 36 inches. The upper 2 inches is light reddish brown, friable channery sandy loam; the next, 2 inches is dark brown, friable channery sandy loam; and the lower 30 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable very channery coarse sandy loam.

In a typical profile in a wooded area, the Dekalb soils have a black, channery sandy loam surface layer about 1 inch thick. This layer is underlain by a gray, channery sandy loam subsurface layer 3 inches thick. The subsoil extends to a depth of 21 inches. The upper part is brownish yellow, very friable channery sandy loam 5 inches thick; the lower part is yellowish brown, very friable very channery sandy loam. The substratum is strong brown, friable very channery sandy loam. Gray sandstone bedrock is at a depth of 25 inches.

Because of the extremely stony surface of these soils, they have not been investigated as thoroughly as other soils in the survey area. The expected use of the soils will not be affected by the stones. Included with these soils in mapping are a few small areas of extremely stony Laidig soils and small areas of Rubble land.

These soils have moderately rapid to rapid permeability and a moderate to very low available water capacity. Where unlimed, the soils are strongly acid or very strongly acid throughout. Runoff is slow. The rooting depth may be restricted by bedrock. Because they are extremely stony, these soils have poor potential for cultivated crops and pasture and are used mainly for woodland. They have poor to good potential for woodland and poor potential for most nonfarm uses.

These soils are not used for cultivated crops because of the numerous surface stones. The stones also limit the potential for pasture. The expense involved in removing the stones makes it impractical to consider the soils for these uses.

Most of the acreage of these soils is in woodland. Productivity ranges from poor on the Dekalb soils to good on the Hazleton soils. The rooting depth may be restricted by bedrock. The numerous surface stones limit equipment selection and also interfere with machine planting. Seedling mortality is a serious problem on the Dekalb part of this complex.

These soils are seriously limited for nonfarm uses because of the surface stones and depth to bedrock.

The Rubble land included in mapping has more serious problems in use and management than the rest of the complex. Capability subclass VIIs.

HSD—Hazleton-Dekalb extremely stony sandy loams, moderately steep. These deep and moderately deep, extremely stony, moderately steep soils are along narrow drainageways and on the sides of hills and ridges on uplands. Slopes are generally 400 to more than 1,000 feet in length. The areas are irregular in shape and range from 2 to 100 acres in size. The Hazleton soils make up more than 50 percent of most areas, and the Dekalb soils less than 30 percent.

In a typical profile the Hazleton soils have a black, channery sandy loam surface layer 1 inch thick. This layer is underlain by a dark gray, friable, channery sandy loam subsurface layer 1 inch thick. The subsoil extends to a depth of 36 inches. The upper 2 inches is light reddish brown, friable channery sandy loam; the next 2 inches is dark brown, friable channery sandy loam; and the lower 30 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable very channery coarse sandy loam.

In a typical profile the Dekalb soils have a black, channery sandy loam surface layer about 1 inch thick. This layer is underlain by a gray, channery sandy loam subsurface layer 3 inches thick. The subsoil extends to a depth of 21 inches. The upper 5 inches is brownish yellow, very friable channery sandy loam; the lower 16 inches is yellowish brown, very friable very channery sandy loam. The substratum is strong brown, friable very channery coarse sandy loam. Gray sandstone bedrock is at a depth of 25 inches.

Because of their thin, extremely stony surface, these soils have not been investigated as thoroughly as other soils in the survey area. The expected use of the soils will not be affected by the slope and surface stones. Included with these soils in mapping are a few small areas of extremely stony Laidig soils. Small areas of Rubble land are also included.

These soils have moderately rapid to rapid permeability and a moderate to very low available water capacity. Where unlimed, the soils are strongly acid or very strongly acid throughout. Runoff is rapid. The rooting depth may be restricted by bedrock. These soils have poor potential for farming and are used mainly for woodland. They have poor to good potential for woodland and poor potential for most nonfarm uses.

These soils are not used for cultivated crops and pasture because of the extremely stony surfaces.

A large acreage of these soils is in woodland. Productivity is poor on the Dekalb soils and good on the Hazleton soils. The rooting depth may be restricted by bedrock. Surface stones limit equipment selection and interfere with the mechanical planting of trees. Seedling mortality is a serious problem on the Dekalb part of this complex. Logging roads should be constructed on the contour to reduce erosion at harvest time.

These soils are seriously limited for nonfarm uses because of stoniness, depth to bedrock, and slope.

The Rubble land included in mapping has more serious problems in use and management than the rest of the complex. Capability subclass VIIs.

HTF—Hazleton-Dekalb association, steep. The deep and moderately deep, extremely stony, steep soils of this association are on the sides of gorges, hills, and ridges in the uplands. Slopes range from 25 to 70 percent and are generally 400 to more than 1,000 feet in length. The areas are irregular in shape and range from 2 to 100 acres in size. Individual areas consist mostly of Hazleton soils, but the proportion of the soils varies in the different areas. The Hazleton soils make up about 55 percent of this association, and the Dekalb soils make up 25 percent.

In a typical profile, the Hazleton soils have a black, channery sandy loam surface layer about 1 inch thick. This layer is underlain by a dark gray, friable channery sandy loam subsurface layer 1 inch thick. The subsoil extends to a depth of 36 inches. The upper 2 inches is light reddish brown, friable channery sandy loam; the next 2 inches is dark brown, friable channery sandy loam; and the lower 30 inches is dark brown, friable very channery sandy loam. The substratum to a depth of 60 inches is strong brown, friable, very channery coarse sandy loam.

In a typical profile, the Dekalb soils have a black, channery sandy loam surface layer about 1 inch thick. This layer is underlain by a gray channery sandy loam subsurface layer 3 inches thick. The subsoil extends to a depth of 21 inches. The upper 5 inches is brownish yellow, very friable channery sandy loam; the lower 16 inches is yellowish brown, very friable very channery sandy loam. The substratum is strong brown, friable very channery coarse sandy loam. Gray sandstone bedrock is at a depth of 25 inches.

Because of the steepness of slope and stony surface, these soils have not been investigated as thoroughly as other soils in the survey area. They were not mapped separately because they do not differ in expected use. Included with these soils in mapping are a few small areas of extremely stony Laidig soils. Small areas of Rubble land are also included.

These soils have moderately rapid to rapid permeability and a moderate to very low available water capacity. Where unlimed, they are strongly acid or very strongly acid. Runoff is very rapid. The rooting depth may be restricted by bedrock.

These extremely stony soils have poor potential for farming and are used mainly for woodland. They have poor to good potential for woodland and poor potential for most nonfarm uses.

These soils are not used for cultivated crops or pasture because of their stony surface and the slope. A large acreage is used as woodland, and the soils are best suited to that use. Productivity is good on the Hazleton soils, and it is poor on the Dekalb soils. The rooting depth may be restricted by bedrock. Stoniness and slope present serious problems in management.

These soils are limited for nonfarm uses because of depth to bedrock, stoniness, and slope.

The Rubble land included in mapping has more serious problems in use and management than the rest of the association. Capability subclass VIIs.

KlB—Klinesville shaly silt loam, 3 to 8 percent slopes. This gently sloping, shallow, well drained soil is on dissected uplands. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and range from 2 to 5 acres in size.

In a typical profile, where this soil has been cultivated, the surface layer is dark reddish brown, shaly silt loam about 6 inches thick. The subsoil, which extends to a depth of 12 inches, is weak red, friable shaly silt loam. The substratum is weak red, firm very shaly silt loam. Weak red, fractured shale bedrock is at a depth of 19 inches.

Included in mapping are small areas of moderately deep soils. Also included are small areas of moderately well drained soils.

This shallow, well drained soil has moderately rapid permeability and very low available water capacity. Where unlimed, the soil ranges from very strongly acid to medium acid. Runoff is moderate. The rooting depth may be restricted by bedrock.

This soil has fair potential for farming and fair potential for pasture and woodland. It is used mainly for woodland. It has limitations for most nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity for plants. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. In places, bedrock hinders the construction of diversions. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include rotation grazing and proper stocking rates to help maintain a desirable selection of plants. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

Many acres of this soil are wooded. Productivity is fair, but the rooting depth may be restricted by shale bedrock. A major management problem is seedling mortality due to the very low available water capacity. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of depth to shale bedrock and the content of coarse fragments. The shallowness of the underlying rock is a serious limitation for onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment.

The moderately deep soils included in mapping have less serious limitations to use and management. The moderately well drained included soils have problems related to wetness. Capability subclass IIIe.

KlC—Klinesville shaly silt loam, 8 to 15 percent slopes. This sloping, shallow, well drained soil is on the sides of prominent and secondary ridges. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and normally range from about 2 to 20 acres in size.

In a typical profile the surface layer is dark reddish brown shaly silt loam about 1 inch thick. The subsurface layer, which extends to a depth of 6 inches, is weak red shaly silt loam. The subsoil, about 6 inches thick, is weak red, friable shaly silt loam. The substratum is weak red, firm very shaly silt loam. Bedrock is at a depth of 19 inches.

Included in mapping are small areas of moderately deep soils. Also included are small areas of moderately well drained soils.

This shallow, well drained soil has moderately rapid permeability and very low available water capacity. Where unlimed, the soil is very strongly acid to medium acid throughout the profile. Runoff is moderate. The rooting depth may be restricted by bedrock.

This soil has poor to fair potential for farming, but it is used mainly for grass and pasture. It has fair to good potential for pasture and fair potential for woodland. It is limited for most nonfarm uses.

If this soil is used for cultivated crops, the severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. In places, bedrock hinders the construction of diversions. Incorporating some crop residue and manure into the surface layer helps maintain organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable selection of plants, and rotation grazing. For optimum production, the level of fertility must be maintained through periodic applications of nutrients.

Many acres of this soil are wooded. Productivity is poor to fair, and rooting depth may be restricted by the shale bedrock. A major management problem is seedling mortality due to the shallowness to bedrock and very low available water capacity. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, depth to bedrock, and coarse fragments. The shallowness to underlying rock is a serious limitation for onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The soils included in mapping are deeper, have a higher available water capacity, and present fewer problems for use and management than the Klinesville soil. Capability subclass IVe.

KlD—Klinesville shaly silt loam, 15 to 25 percent slopes. This moderately steep, shallow, well drained soil is on the sides of prominent and secondary ridges of the uplands. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and range from 2 to 20 acres in size.

In a typical profile, where this soil has been cultivated, the surface layer is dark reddish brown shaly silt loam about 6 inches thick. The subsoil, about 6 inches thick, is weak red, friable shaly silt loam. The substratum is weak red, firm very shaly silt loam. Fractured shale bedrock is at a depth of 19 inches.

Included in mapping are small areas of moderately deep soils. Also included are small areas of moderately well drained soils.

This shallow, well drained soil has moderately rapid permeability and very low available water capacity Where unlimed, it is very strongly acid to medium acid throughout. Runoff is rapid. The rooting depth may be restricted by bedrock.

This soil has poor potential for farming and is used mainly for grass and pasture. It has fair potential for pasture and for woodland. It is limited for most nonfarm uses.

This soil is not suited to cultivated crops because of the moderately steep slopes and the severe hazard of erosion. Further erosion will result in a shallower rooting depth and lower available water capacity.

The soil is better suited to pasture than to cultivated crops. If it is used for pasture, management should include proper stocking rates to help maintain a desirable balance of plants and rotation grazing. For optimum production, fertility must be maintained through periodic applications of nutrients.

Many acres of this soil are wooded. Productivity is fair, and the rooting depth may be restricted by the shale bedrock. A major management problem is seedling mortality caused by the shallowness to bedrock and very low available water capacity. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, depth to bedrock, and coarse fragments. The shallowness of the underlying rock is a serious limitation for the onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The soils included in mapping are deeper, have a higher available water capacity, and present fewer problems for use and management than the Klinesville soil. Capability subclass VIe.

KlF—Klinesville shaly silt loam, 25 to 50 percent slopes. This steep to very steep, well drained, shallow soil is on the sides of prominent and secondary ridges. Slopes are generally 400 to 1,000 feet or more in length. The areas are irregular in shape and normally range from 2 to 20 acres in size.

In a typical profile the surface layer is dark reddish brown shaly silt loam about 1 inch thick. The subsurface layer, which extends to a depth of 6 inches, is weak red, friable shaly silt loam. The subsoil, about 6 inches thick, is weak red, friable shaly silt loam. The substratum is weak red, firm shaly silt loam. Fractured shale bedrock is at a depth of 19 inches.

Included in mapping are small areas of moderately deep soils.

This shallow, well drained soil has moderately rapid permeability and very low available water capacity. Where unlimed, the soil is very strongly acid to medium acid throughout. Runoff is very rapid. The rooting depth may be restricted by bedrock.

This soil has very poor potential for farming and is used mainly for woodland. It has severe limitations for many nonfarm uses.

This soil is not suited to cultivated crops or pasture because of the steep slopes and the very severe hazard of erosion. Further erosion will result in a shallower rooting depth and lower available water capacity.

Nearly all areas of this soil are wooded. Productivity for trees is fair, and the rooting depth may be restricted by the shale bedrock. A major management problem is seedling mortality, which is a result of the very low available water capacity. Slope limits the selection of machinery, and machine planting of trees is not practical.

This soil is limited for nonfarm uses because of slope, depth to shale bedrock, coarse fragments, and very low available water capacity. The shallowness of the underlying rock and the slope are serious limitations for the onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The soils included in mapping have similar problems in use and management to those of the Klinesville soil. Capability subclass VIIe.

KrB—Kreamer cherty silt loam, 2 to 8 percent slopes. This nearly level to gently sloping, moderately well drained soil occurs on the benches of the cherty uplands. Slopes are generally variable in length and are smooth and concave. The areas are irregular in shape and about 2 to 15 acres in size.

In a typical profile the surface layer is dark brown cherty silt loam about 9 inches thick. The subsoil extends to a depth of 64 inches. In sequence from the top, it is 6 inches of yellowish brown, friable cherty silty clay loam; 5

inches of yellowish brown, firm cherty silty clay loam; 8 inches of strong brown, firm cherty silty clay; 12 inches of dark yellowish brown, firm cherty clay; and 24 inches of strong brown, firm cherty silty clay. The substratum to a depth of 70 inches is yellowish brown, firm cherty silty clay.

Included with this soil in mapping are a few areas of deep, well drained Mertz soils.

This soil has slow permeability, and the available water capacity is moderate. Runoff is medium. A water table is at a depth of 18 to 36 inches for long periods during wet seasons. In unlimed areas the soil is neutral to very strongly acid in the surface layer and upper part of the subsoil and strongly acid or very strongly acid in the lower part of the subsoil.

Most areas of this soil are used for crops. A few areas are in woodland. This soil is suited to all crops common in the area. It has good potential for growing trees and limited potential for many nonfarm uses.

When this soil is used for cultivated crops, the hazard of erosion is moderate. Contour stripcropping, minimum tillage, sod waterways, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to help remove excess water and allow for timely tillage.

This soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Stocking at proper rates to maintain a desirable plant population, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small area is naturally wooded, and many of the once-cultivated idle fields are reverting to trees. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of wetness resulting from the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because of slow permeability and a seasonal high water table. There is a possibility of ground-water pollution if the soil is used for onsite disposal of waste. The seasonal high water table is also a hazard for buildings with subsurface basements—they need foundation drains with proper outlets to prevent seepage of water into the basements.

There are fewer limitations to the use and management of the included Mertz soils. Capability subclass IIe.

KrC—Kreamer cherty silt loam, 8 to 15 percent slopes. This sloping, moderately well drained soil is on benches of the cherty uplands. Slopes are generally smooth and concave. The areas are irregular in shape and normally range from 2 to 18 acres in size.

In a typical profile in a cultivated area, the surface layer is dark brown cherty silt loam 8 inches thick. The subsoil extends to a depth of 60 inches. In sequence from the top, it is 7 inches of yellowish brown, friable, cherty silty clay loam; 5 inches of yellowish brown, firm cherty silty clay loam; 8 inches of strong brown, firm cherty silty clay; 12 inches of dark yellowish brown, firm cherty silty clay; 8 inches of yellowish brown, firm cherty clay; and 12 inches of strong brown, firm cherty silty clay. The substratum, to a depth of 67 inches, is yellowish brown, firm cherty silty clay.

Included in mapping are small areas of deep, well drained Mertz soils.

This moderately well drained soil has slow permeability and moderate available water capacity. Where unlimed, it is neutral to very strongly acid in the surface layer and upper part of the subsoil and strongly acid or very strongly acid in the lower part of the subsoil.

This soil has good potential for farming and is used mainly for row crops. It has good potential for pasture and for woodland. It has serious limitations for some nonfarm uses.

If this soil is used for cultivated crops, the severe hazard of erosion needs to be considered. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

This soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Stocking at proper rates, to maintain a desirable balance of plants, and rotation grazing are management needs. For optimum production, soil fertility needs to be maintained through periodic applications of nutrients.

Small areas of this soil are wooded. Productivity is good. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, slow permeability, and a seasonal high water table. There is a possibility of ground-water pollution if the soil is used for the onsite disposal of waste. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

There are fewer limitations to the use and management of the included Mertz soils. Capability subclass IIIe.

LaB—Laidig channery loam, 3 to 8 percent slopes. This gently sloping soil is on benches and foot slopes of ridges, mainly in the mountainous part of the survey area. The areas are irregular in shape and normally range from 3 to 15 acres in size.

In a typical profile this soil has a surface layer of dark grayish brown channery loam 2 inches thick. The subsurface layer is yellowish brown channery loam about 3 inches thick. The subsoil is about 60 inches thick. The

upper 5 inches is yellowish brown, friable channery loam; the next 20 inches is strong brown, firm sandy clay loam; and the lower 35 inches is yellowish brown, firm and brittle sandy clay loam.

Included with this soil in mapping are small areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are a few small areas of poorly drained Andover soils.

This well drained soil is moderately permeable above the fragipan, but the fragipan is moderately slowly permeable. The available water capacity is moderate. Where unlimed, the soil is strongly acid to very strongly acid. The soil is well drained but may temporarily have a perched water table during wet seasons. Runoff is medium. The rooting depth for deep rooting plants is restricted by the fragipan.

Most areas of this soil are used for general farm crops; small areas are used for pasture and homesites. The soil has good potential for farming and is well suited to pasture and trees. The potential for homesites is good, but the soil has poor potential for onsite waste disposal.

When cultivated crops are grown, there is a moderate hazard of erosion. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grasses and legumes in the cropping system. Where topography is suitable, stripcropping can be used; and where needed, diversions should be used. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the soil's tendency to clod and crust.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees. A very small acreage is wooded. Productivity is good, but rooting depth may be restricted by the fragipan. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the moderately slowly permeable fragipan in the subsoil and coarse fragments in the soil. Moderately slow permeability is a limitation for onsite waste disposal. During construction on this soil, management practices may be needed to control erosion and sediment.

The Hazleton soils included in mapping have less severe limitations for most uses than this Laidig soil; whereas the included Buchanan and Andover soils are more severely limited by wetness. Capability subclass IIe.

LaC—Laidig channery loam, 8 to 15 percent slopes. This sloping soil is on benches and foot slopes of ridges, mainly in the mountainous part of the survey area. The areas are irregular in shape and normally range from 3 to 15 acres in size.

In a typical profile in a cultivated area, the surface layer is dark brown channery loam about 6 inches thick. The subsoil is about 60 inches thick. The upper 5 inches is yellowish brown, friable channery loam; the next 19 inches is strong brown, firm sandy clay loam; and the lower 36 inches is yellowish brown, firm and brittle sandy clay loam.

Included with this soil in mapping are small areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are a few small areas of poorly drained Andover soils.

This well drained soil is moderately permeable above the fragipan, but the fragipan is moderately slowly permeable. The available water capacity is moderate. Where unlimed, the soil is strongly acid to very strongly acid. The soil is well drained but may temporarily have a perched water table during wet seasons. Runoff is medium. The rooting depth for deep rooting plants is restricted by the fragipan layer in the subsoil.

Most areas of this soil are used for general farm crops; small areas are used for pasture and homesites. The soil has good potential for farming and is well suited to pasture and trees. The potential for homesites is good, but the soil has poor potential for onsite waste disposal.

If cultivated crops are grown, there is a severe hazard of erosion. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grasses and legumes in the cropping system. Where the topography is suitable, stripcropping can be used; and where needed, diversions should be used. Incorporating some crop residue into the surface layer will help maintain organic matter content and reduce the soil's tendency to clod and crust.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good, but rooting depth may be restricted by the fragipan. Management problems are moderate. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of the moderately slowly permeable fragipan in the subsoil and coarse fragments in the soil. Moderately slow permeability is a limitation for onsite waste disposal. During construction on this soil, management practices may be needed to control erosion and sediment accumulation.

The Hazleton soils included in mapping have less severe limitations for most uses than this Laidig soil, whereas the included Buchanan and Andover soils are more severely limited by wetness. Capability subclass IIIe.

LaD—Laidig channery loam, 15 to 25 percent slopes. This moderately steep soil is on the sides and foot slopes of ridges, mainly in the mountainous part of the survey area. The areas are irregular in shape and normally range from 3 to 15 acres in size.

In a typical profile in a cultivated area the surface layer is dark brown channery loam about 6 inches thick. The subsoil is about 60 inches thick. The upper 5 inches is yellowish brown, friable channery loam; the next 19 inches is strong brown, firm sandy clay loam; and the lower 36 inches is yellowish brown, firm and brittle sandy clay loam.

Included with this soil in mapping are small areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are a few small areas of poorly drained Andover soils.

This well drained soil is moderately permeable above the fragipan, but the fragipan is moderately slowly permeable. The available water capacity is moderate. Where unlimed, the soil is strongly acid to very strongly acid. The soil is well drained but may temporarily have a perched water table during wet seasons. Runoff is medium. The rooting depth for deep-rooting plants is restricted by the fragipan.

Most areas of this soil are used for general farm crops; small areas are used for pasture and homesites. The soil has fair potential for farming and is well suited to pasture and trees. The potential for homesites is poor, and the soil has poor potential for onsite waste disposal.

When cultivated crops are grown, there is a severe hazard of erosion. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grasses and legumes in the cropping system. Where the topography is suitable, stripcropping can be used; and where needed, diversions should be used. Incorporating some crop residue into the surface layer will help maintain organic-matter content and reduce the soil's tendency to clod and crust.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good, but the rooting depth may be restricted by the fragipan. Management problems are moderate. Slope should be considered in machinery selection. Machine planting of trees is practical in the large areas. Logging roads should be constructed on the contour to reduce erosion during harvesting.

This soil is somewhat limited for nonfarm uses because of moderately slow permeability, moderately steep slopes, and coarse fragments in the soil. Moderately slow permeability and slope are limitations for onsite waste disposal. During construction on this soil, management practices are needed to control erosion and sediment.

The Hazleton soils included in mapping have less severe limitations for most uses than this Laidig soil, whereas the included Buchanan and Andover soils are more severely limited by wetness. Capability subclass IVe.

LcB—Laidig extremely stony loam, 3 to 8 percent slopes. This gently sloping, extremely stony, well drained soil is on benches, foot slopes, and sides of upland ridges. Slopes are generally smooth and concave and are mainly 400 to 1,000 feet in length. The areas are irregular in shape and range from about 2 to 50 acres in size.

In a typical profile the surface layer is dark grayish brown channery loam about 2 inches thick. The subsurface layer is yellowish brown, channery loam about 3 inches thick. The subsoil is about 60 inches thick. The upper 5 inches is yellowish brown, friable channery loam; the next 20 inches is strong brown, firm sandy clay loam; and the lower 35 inches is yellowish brown, firm and brittle sandy clay loam.

Included with this soil in mapping are a few areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are scattered areas of poorly drained Andover soils.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. The subsoil has a moderately slowly permeable fragipan. The rooting depth may be restricted by the fragipan. In unlimed areas, the soil is strongly acid to very strongly acid throughout. Most areas of this soil are in woodland.

This soil is too stony for cultivated crops and pasture. It is best suited to trees for which it has good potential. It has only limited potential for many nonfarm uses.

Most areas of this soil are wooded, and many idle areas are reverting to trees. Pruning undesirable trees increases production. Large surface stones interfere with equipment selection and with machine planting of trees.

This soil is limited for some nonfarm uses because it is moderately slowly permeable and has surface stones. Moderately slow permeability in the fragipan and the high content of surface stones are limitations for onsite disposal of waste. If buildings with basements are constructed in this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Buchanan and Andover soils included in mapping have more serious problems in use and management because they are wet. Capability subclass VIIs.

LcD—Laidig extremely stony loam, 8 to 25 percent slopes. This sloping to moderately steep, deep, well drained, extremely stony soil is on the sides of prominent and secondary ridges of the upland. Slopes are generally smooth and concave and are mainly 400 to 1,000 feet in length. The areas are irregular in shape and range from about 2 to 200 acres in size.

In a typical profile the surface layer is dark grayish brown channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam about 3 inches thick. The subsoil is about 55 inches thick. The upper 5 inches is yellowish brown, friable channery loam; the next 20 inches is strong brown, firm sandy clay loam; and the lower 30 inches is yellowish brown, firm and brittle sandy clay loam.

Included with this soil in mapping are a few areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are scattered areas of poorly drained Andover soils.

This soil has moderately slow permeability and moderate available water capacity. Runoff is rapid. The subsoil has a moderately slowly permeable fragipan. The rooting depth may be restricted by the fragipan. In unlimed areas, the soil is strongly acid to very strongly acid throughout. Most areas of this soil are in woodland.

This soil is too stony for cultivated crops and pasture. It is best suited to trees, and it has good potential for growing trees. Its potential for many nonfarm uses is poor.

Most areas of the soil are wooded, and many idle areas are reverting to trees. Pruning undesirable trees increases production. Logging roads should be constructed on the contour to reduce erosion during harvesting. Large stones interfere with equipment selection and with machine planting of trees.

This soil is limited for most nonfarm uses because of moderately slow permeability, surface stones, and slope. Moderately slow permeability and the high content of surface stones are limitations for onsite disposal of waste.

Buchanan and Andover soils included in mapping have more serious problems in use and management because they are wet. Capability subclass VIIs.

LDF—Laidig extremely stony loam, steep. This steep, well drained soil is on the sides of prominent and secondary ridges of the uplands. Slopes are 25 to 45 percent and are smooth and concave. The areas are irregular in shape and normally range from 10 to 250 acres in size.

In a typical profile in a wooded area, this soil has a dark brown, channery loam surface layer 1 inch thick. The subsurface layer extends to a depth of 4 inches, and is yellowish brown channery loam. The subsoil is about 56 inches thick. The upper 5 inches is yellowish brown, friable channery loam; the next 2 inches is strong brown, firm sandy clay loam; and the lower 30 inches is yellowish brown, firm and brittle sandy clay loam.

Included in mapping are small areas of well drained Hazleton soils and moderately well drained Buchanan soils. Also included are scattered areas of poorly drained Andover soils.

This well drained soil has moderately slow permeability and moderate available water capacity. Where unlimed, the soil is strongly acid to very strongly acid throughout. Runoff is rapid. The rooting depth of some plants may be restricted by the fragipan in the subsoil.

This soil has very poor potential for farming and is used mainly for woodland. It has poor potential for pasture. The potential for woodland is fair to good. Limitations for some nonfarm uses are severe.

This soil is too stony and too steep to be used for cultivated crops or for pasture. It is better suited to woodland and wildlife habitat.

Most areas of this soil are wooded. Productivity is fair to good, but rooting depth may be restricted by the firm fragipan. Slope and surface stones are serious problems for equipment selection, and they make machine planting on larger areas impractical. Roads constructed during harvesting should be on the contour to reduce erosion.

This soil is limited for nonfarm uses because of moderately slow permeability, steep to very steep slopes, and surface stones. These are serious limitations for the onsite disposal of waste. If this soil is disturbed for construction, management practices are necessary to control erosion and sediment accumulation.

The soils included in mapping have problems of use and management similar to those of the Laidig soil. Buchanan and Andover soils have additional problems related to wetness. Capability subclass VIIs.

LtB—Leetonia extremely stony loamy sand, 0 to 12 percent slopes. This nearly level to sloping soil is on the sides of prominent and secondary ridges of the uplands. Slopes are smooth and concave. The areas are usually irregular in shape and range from 5 to 50 acres in size.

In a typical profile in a wooded area the surface layer is dark gray gravelly loamy sand about 2 inches thick. This layer is underlain by a light brownish gray, very friable, gravelly loamy sand subsurface layer about 4 inches thick. The subsoil is about 17 inches thick. The upper 11 inches is dark brown, very friable gravelly loamy sand; and the lower 6 inches is brownish yellow, loose very gravelly sand. The substratum is olive yellow, loose very gravelly sand. Gray sandstone bedrock is at a depth of 48 inches.

Included with this soil in mapping are small areas of moderately deep, well drained Dekalb soils. Also included are a few small areas of deep, well drained Hazleton soils.

This deep, well drained soil is moderately rapidly permeable. The available water capacity is very low. Where unlimed, the soil is very strongly acid to extremely acid throughout. Runoff is slow to medium.

Most areas of this soil are used for woodland. This soil is best suited to trees. Although some small areas are used for wild blueberries, the soil has very poor potential for farming. The potential for homesite and for onsite waste disposal is poor.

This soil is too stony for cultivated crops and for pasture. It is better suited to woodland and wildlife. Most of the acreage is wooded, and productivity is fair to good. Large surface stones interfere with equipment selection and make machine planting of trees impractical. Seedling mortality is also a serious problem.

This soil is limited for nonfarm uses because of stoniness and the very low available water capacity. Stoniness is a serious limitation for onsite waste disposal and for homesite construction. During construction on this soil, management practices may be needed to control erosion and sediment accumulation.

There are similar limitations to the use and management of the included Dekalb and Hazleton soils. Capability subclass VIIs.

Ma—Melvin silt loam. This deep, nearly level, poorly drained soil is on flood plains, mainly in the areas of limestone and calcareous shale. The areas are irregular in shape and normally range from 2 to 15 acres in size.

In a typical profile this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a

depth of 40 inches. The upper 15 inches is gray, firm silty clay loam, and the lower 16 inches is light gray, firm silty clay loam. The substratum, to a depth of 60 inches, is light gray, friable gravelly silt loam.

Included with this soil in mapping are small areas of Newark soils and scattered very wet spots.

This soil is moderately permeable, and the available water capacity is high. Reaction ranges from slightly acid to mildly alkaline throughout the profile, in unlimed areas. A high water table is within 6 inches of the surface for a large part of the year. Runoff is slow. The rooting depth is restricted by the high water table.

Most areas of this soil are used for permanent pasture. If properly drained this soil can be used occasionally for row crops. It has good potential for trees and limited potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in spring. Crops may be damaged by floodwater following intensive rainfall. Excess surface water can be drained away by keeping natural drainageways open and by installing open drains where outlets are available.

The soil has good potential for permanent pasture. Grazing of pasture when this soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer becomes compacted. Stocking at proper rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to moisture-tolerant trees; a very small acreage is wooded. The rooting depth is restricted by the high water table, and use of equipment is restricted for a large part of the year. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of the high water table and flooding. It has some potential for wildlife and recreational uses.

The included Newark soils have similar limitations to use and management. Capability subclass IIIw.

MeB—Mertz cherty silt loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on the cherty uplands. Slopes are generally smooth and concave. The areas are irregular in shape and about 2 to 5 acres in size.

In a typical profile the surface layer is dark brown cherty silt loam about 9 inches thick. The subsoil extends to a depth of about 63 inches. The upper 7 inches is brown, friable cherty silty clay loam; the next 10 inches is strong brown, firm cherty heavy silt loam; the next 9 inches is strong brown, firm very cherty heavy loam; and the lower 28 inches is strong brown, firm very cherty clay loam.

Included with this soil in mapping are a few areas of well drained Elliber soils. Also included are scattered areas of moderately well drained Kreamer soils.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. The subsoil has a high concentration of coarse fragments. In unlimed areas, the soil is slightly acid to strongly acid in the surface layer and upper part of the subsoil and strongly acid or very strongly acid in the lower part of the subsoil.

Most areas of this soil are used for crops. A few areas are in woodland. This soil has good potential for farming, and it is also suited to pasture and trees. It has serious limitations for many nonfarm uses.

When this soil is used for cultivated crops, there is a moderate hazard of erosion. Contour stripcropping, diversions, minimum tillage, sod waterways, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. The high percentage of chert fragments may interfere with the seeding and harvesting of some crops.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees. A small acreage is naturally wooded, and many formerly cultivated but now idle areas are reverting to trees. Productivity is good, and pruning undesirable trees increases production. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it is moderately slowly permeable and has a high content of chert fragments. Moderately slow permeability is a serious limitation for onsite disposal of waste. The high content of chert fragments is a limitation for lawns, golf fairways, and many other uses.

The Elliber soils included in mapping have similar problems in use and management, and the Kreamer soils have additional problems related to wetness. Capability subclass IIe.

MeC—Mertz cherty silt loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on the sides of the secondary ridges of the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 40 acres in size.

In a typical profile the surface layer is dark brown cherty silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. In a sequence from the top, it is 7 inches of brown, friable cherty silty clay loam; 10 inches of strong brown, firm cherty heavy silt loam; 9 inches of strong brown, firm very cherty heavy silt loam; 11 inches of strong brown, firm very cherty clay loam; and 15 inches of strong brown, firm very cherty clay loam.

Included with this soil in mapping are a few areas of well drained Elliber soils and scattered areas of moderately well drained Kreamer soils.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. In unlimed areas, the soil is slightly acid to strongly acid in the surface layer and upper part of the subsoil, and strongly acid or very strongly acid in the lower part of the subsoil.

Most of the acreage of this soil is used for crops; small areas are used for woodland. The soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is fair to good, but there are problems if the soil is used for onsite waste disposal or other nonfarm uses.

If this soil is used for cultivated crops, the hazard of erosion is moderate. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue and manure, and including hay in the cropping system are practices that help to maintain organic-matter content and good tilth. Stripcropping, cover crops, minimum tillage, and diversions can be used to reduce erosion. The cherty surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable selection of plants, and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good, and pruning undesirable trees will increase production. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses by slope, moderately slow permeability, and coarse fragments. Moderately slow permeability is a limitation for onsite waste disposal.

The Elliber soils included in mapping have limitations to use and management similar to those of this Mertz soil. The included Kreamer soils have additional limitations related to wetness. Capability subclass IIIe.

MeD—Mertz cherty silt loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on the sides of the secondary ridges of the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 40 acres in size.

In a typical profile in a cultivated area the surface layer is dark brown cherty silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches. In sequence from the top, it is 7 inches of brown, friable cherty silty clay loam; 10 inches of strong brown, firm cherty heavy silt loam; 9 inches of strong brown, firm very cherty heavy silt loam; and 27 inches of strong brown, firm very cherty clay loam.

Included with this soil in mapping are a few areas of well drained Elliber soils and scattered areas of moderately well drained Kreamer soils.

This soil has moderately slow permeability and a moderate available water capacity. Runoff is rapid. The surface layer is more than 25 percent chert fragments. In unlimed areas, the soil is slightly acid to strongly acid in the surface layer and upper part of the subsoil and strongly acid or very strongly acid in the lower part of the subsoil.

Most of the acreage of this soil is used for crops; small areas are used for woodland. This soil has fair potential for farming, and it is suited to pasture and trees. The potential for homesites and most other nonfarm uses is poor.

If this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, sod waterways, and cover crops are some practices needed to control erosion. Using crop residue and manure are ways of maintaining organic-matter content. The cherty surface layer may interfere with the seeding of some crops.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good. Moderately steep slopes are a limitation in equipment selection. Machine planting of trees is practical in the large areas.

This soil is limited for nonfarm uses because of moderately steep slopes, moderately slow permeability, and coarse fragments. Moderately slow permeability and slope are serious limitations for onsite waste disposal, and slope is a limitation for homesites.

The Elliber soils included in mapping have limitations to use and management similar to those of the Mertz soil. The Kreamer soils have additional limitations related to wetness. Capability subclass IVe.

MnB—Millheim silt loam, 3 to 8 percent slopes. This deep, well drained, gently sloping soil is on undulating dissected foothills in upland valleys. Slopes are generally 50 to 400 feet in length. The areas are mainly irregular in shape and range from 2 to 4 acres in size.

In a typical profile of this soil in a cultivated area, the surface layer is dark brown, friable silt loam 7 inches thick. The subsoil extends to a depth of 37 inches. It is brown, firm silty clay loam and yellowish brown, firm shaly silty clay in the upper 14 inches; and dark brown, friable shaly silty clay in the lower part. The substratum is very dark grayish brown, friable very shaly silty clay. Very dark gray carbonaceous shale bedrock is at a depth of 43 inches.

Included in mapping are small areas of Berks soils and small areas of soils that are less than 40 inches deep.

This well drained soil has moderate permeability and moderate to high available water capacity. If not limed the soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil and in the substratum. Runoff is moderate.

This soil has good potential for farming and is used mainly for general farm crops. It has very good potential for pasture and for woodland. Depth to bedrock is a limitation for some nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower availa-

ble water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grass and legumes in the cropping system. Where the topography is suitable, strip-cropping can be used. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic application of nutrients.

A small acreage of this soil is wooded. Productivity is very good, but rooting depth may be restricted by the limited depth to bedrock. Management problems are few on this soil. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of the depth to bedrock and high percentage of shale fragments in the subsolum. Ground water contamination may be a problem if this soil is used for the disposal of waste. If this soil is disturbed for construction, management practices may be needed to control erosion and sediment accumulation.

The Berks soils included in mapping are moderately deep and have a higher content of coarse fragments than this Millheim soil, and they present greater problems for use and management. Capability subclass IIe.

MnC—Millheim silt loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on undulating dissected foothills in upland valleys. Slopes are generally 50 to 400 feet in length. The areas are irregular in shape and are 2 to 4 acres in size.

In a typical profile the surface layer is dark brown, friable silt loam about 6 inches thick. The subsoil extends to a depth of 36 inches. The upper 4 inches is brown, firm silty clay loam; the next 10 inches is yellowish brown, firm shaly silty clay; and the lower 16 inches is dark brown, friable shaly silty clay. The substratum, to a depth of 42 inches, is very dark grayish brown, friable shaly silty clay.

Included with this soil in mapping are a few areas of moderately deep Berks soils and scattered areas of other soils that are less than 40 inches deep.

This soil has moderate permeability and moderate to high available water capacity. Runoff is medium. In unlimed areas the soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil and in the substratum.

Most of the acreage of this soil is in cropland; small areas are used for woodland and pastures. This soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good, but the soil has limitations for onsite waste disposal and for most other nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grasses and legumes in the cropping system. Growing cover crops, using crop residue, and including hay in the cropping system are ways of maintaining the organic-matter content and good tilth of the soil.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable selection of plants, and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good. Management problems are related to slopes. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses by slope and the limited depth to bedrock. There is a possibility of ground-water contamination if the soil is used for onsite waste disposal.

The soils included in mapping have more limitations to use and management than this Millheim soil. Capability subclass IIIe.

MoA—Monongahela silt loam, 0 to 3 percent slopes. This deep, moderately well drained, nearly level soil is on high bottoms and stream terraces along the major rivers in the survey area. The areas are irregular in shape and normally range from 2 to 5 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of 56 inches. The upper 18 inches is yellowish brown, friable silt loam; and the lower 28 inches is light yellowish brown, firm and brittle loam. The substratum, to a depth of 70 inches, is strong brown, firm clay loam.

Included with this soil in mapping are small areas of deep, well drained Allegheny soils.

This soil is slowly permeable, and the available water capacity is moderate. Reaction is strongly acid to very strongly acid throughout in unlimed areas. A high water table is within 18 to 36 inches of the surface for a large part of the year. Runoff is medium. The rooting depth is restricted by the fragipan.

Most areas of this soil are used for crops. If properly drained, this soil is suitable for row crops. It has good potential for trees. The seasonal high water table and slow permeability limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess surface water can be drained away by keeping natural drainageways open or by constructing closed drains, where outlets are available. Growing cover crops, using crop residue, and including hay in the cropping system are ways to maintain the organic-matter content of the soil.

The soil has good potential for pasture. Grazing of pasture when the soil is wet and overgrazing are the

major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to trees, but only a small portion of the area is wooded. Potential productivity is good, but the rooting depth is restricted by the fragipan. Use of equipment is restricted for part of the year because of the high water table. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of slow permeability and the seasonal high water table. These limitations are serious problems for onsite waste disposal. The soil has good potential for wildlife and recreational uses.

The Allegheny soil included in mapping has fewer limitations for most uses than the Monongahela soil. Capability subclass IIw.

MoB—Monongahela silt loam, 3 to 8 percent slopes. This deep, moderately well drained, gently sloping soil is on high bottoms and terraces mainly along the major rivers of the survey area. The areas are irregular in shape and normally range from 2 to 5 acres in size.

In a typical profile the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of 56 inches. The upper 18 inches is yellowish brown, friable silt loam; the lower 28 inches is light yellowish brown, firm and brittle loam. The substratum to a depth of 70 inches is strong brown, firm clay loam.

Included with this soil in mapping are small areas of deep, well drained Allegheny soils.

This soil is slowly permeable, and the available water capacity is moderate. Reaction is strongly acid to very strongly acid throughout, where limed. Runoff is medium. The rooting depth is restricted by the fragipan.

Most areas of this soil are used for crops. If properly drained, this soil can be used for row crops. It has good potential for growing trees. The seasonal high water table and slow permeability limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Excess surface water can be drained away by keeping natural drainageways open or by constructing closed drains where outlets are available. Stripcropping, cover crops, diversions, sod waterways, and minimum tillage are some practices that can be used to control erosion.

The soil has good potential for pasture. Grazing of pasture when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to trees, and a small acreage is wooded. Potential productivity is good, but the rooting depth is restricted by the fragipan. Use of equipment is restricted for part of the year by the high water table. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of slow permeability and the seasonal high water table. These are serious problems for onsite waste disposal. The soil has good potential for wildlife and recreational uses.

The Allegheny soil included in mapping has fewer restrictions for most uses than the Monongahela soil. Capability subclass IIe.

MrB—Morrison gravelly sandy loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on plateaus and sides of secondary ridges in the dissected uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 100 acres in size.

In a typical profile the surface layer is black gravelly sandy loam about 1 inch thick. The subsurface layer, which extends to a depth of 9 inches, is pale brown gravelly sandy loam. The subsoil extends to a depth of 50 inches. The upper 7 inches is yellowish brown, firm gravelly sandy loam; the next 22 inches is strong brown, firm gravelly sandy loam; and the lower 12 inches is yellowish red, firm gravelly heavy sandy loam. The substratum to a depth of 72 inches is yellowish red, firm gravelly heavy sandy loam.

Included with this soil in mapping are a few areas of moderately deep Berks soils and scattered areas of moderately well drained Ernest soils.

This soil has moderate to moderately rapid permeability and moderate available water capacity. Runoff is medium. In unlimed areas, the soil is strongly acid to extremely acid in the upper part of the solum and strongly acid or medium acid in the lower part.

Most of the acreage of this soil is in woodland, but a moderate acreage is used for crops. The soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good. The soil is suited to most other nonfarm uses.

When this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue and manure, and including hay in the cropping system maintain the organic-matter content and good tilth of the soil. Stripcropping, minimum tillage, diversions, and the use of cover crops are some practices that can be used to control erosion.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

This soil is suited to trees. Productivity is good. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil has few limitations for nonfarm uses. There are additional limitations to the use and management of

the included Berks and Ernest soils. Capability subclass IIe.

MrC—Morrison gravelly sandy loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on the sides of secondary ridges in the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are about 2 to 80 acres in size.

In a typical profile the surface layer is black, gravelly sandy loam about 1 inch thick. The subsurface layer, which extends to a depth of 8 inches, is pale brown gravelly sandy loam. The subsoil extends to a depth of 50 inches. The upper 8 inches is yellowish brown, firm gravelly sandy loam; the next 22 inches is strong brown, firm gravelly heavy sandy loam; and the lower 12 inches is yellowish red, firm gravelly heavy sandy loam. The substratum to a depth of 70 inches is yellowish red, firm gravelly heavy sandy loam.

Included with this soil in mapping are a few areas of moderately deep Berks soils and scattered areas of moderately well drained Ernest soils.

This soil has moderate to moderately rapid permeability and moderate available water capacity. Runoff is rapid. In unlimed areas, the soil is strongly acid to extremely acid in the surface layer and upper part of the subsoil, and strongly acid or medium acid in the lower part of the subsoil.

Most of the acreage of this soil is in woodland, but a moderate acreage is used for crops. The soil has good potential for farming, and it is also suited to pasture and trees. The potential for homesites is good, but there are problems if the soil is used for onsite waste disposal or for most other nonfarm uses.

If this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system are ways of maintaining the organic-matter content and good tilth of the soil. Stripcropping, minimum tillage, diversions, and the use of cover crops are some practices that can be used to control erosion.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees. Productivity is good, although there are some management problems related to slope. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of slope. The areas are generally suitable for homesites, although slope may limit use of the soil for onsite waste disposal and for lawns. Slope is a limitation for many other nonfarm uses.

There are additional limitations to the use and management of the included Berks and Ernest soils. Capability subclass IIIe.

MrD—Morrison gravelly sandy loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on the sides of secondary ridges in the uplands. Slopes are generally smooth and concave. The areas are irregular in shape and are 2 to 90 acres in size.

In a typical profile the surface layer is black gravelly sandy loam about 1 inch thick. The subsurface layer, which extends to a depth of 7 inches, is pale brown gravelly sandy loam. The subsoil extends to a depth of 48 inches. The upper 8 inches is yellowish brown, firm gravelly sandy loam; the next 22 inches is strong brown, firm gravelly heavy sandy loam; and the lower 10 inches is yellowish red, firm gravelly heavy sandy loam. The substratum to a depth of 70 inches is yellowish red, firm gravelly heavy sandy loam.

Included with this soil in mapping are a few areas of moderately deep Berks soils and scattered areas of moderately well drained Ernest soils.

This soil has moderate to moderately rapid permeability and moderate available water capacity. Runoff is rapid. In unlimed areas, the soil is strongly acid to extremely acid in the surface layer and upper part of the subsoil and strongly acid or medium acid in the lower part of the subsoil.

Most of the acreage of this soil is in woodland; a moderate acreage is used for crops. The soil has fair potential for farming, and it is also suited to pasture and trees. The potential for homesites is poor, and there are limitations to use of the soil for onsite waste disposal and for most other nonfarm purposes.

When this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, cover crops, and diversions are some practices that can be used to control erosion. Growing cover crops, using crop residue, and including hay in the cropping system are ways to maintain the organic matter content and good tilth of the soil.

When this soil is used for pasture, management should include proper stocking rates, to maintain a desirable balance of plants, and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients. When cultivating the soil for reseeding, protection from erosion is needed.

The soil is suited to trees, but only a very small acreage is wooded. Moderately steep slopes are a limitation in equipment selection. Productivity is good, and machine planting of trees is practical in the large areas. Logging roads should be constructed on the contour to control erosion at harvest time.

The soil is limited for nonfarm uses because of slope, which is a serious problem for homesites. Slope also limits onsite waste disposal and most other nonfarm uses.

There are additional limitations to the use and management of the included Berks and Ernest soils. Capability subclass IVe.

MuB—Murrill gravelly loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on the undu-

lating dissected hills of the uplands adjacent to the limestone valleys. Slopes are generally smooth and concave. The areas are irregular in shape and are about 2 to 10 acres in size.

In a typical profile the surface layer is dark yellowish brown gravelly loam about 8 inches thick. The subsoil extends to a depth of 80 inches. In sequence from the top, it is 6 inches of brown, friable gravelly loam; 6 inches of yellowish brown, friable gravelly silty clay loam; 11 inches of dark brown, firm gravelly silty clay loam; 29 inches of strong brown, firm gravelly sandy clay loam; and 20 inches of reddish brown, firm gravelly sandy clay loam.

Included with this soil in mapping are a few areas of deep, well drained Hagerstown soils and scattered areas of moderately well drained Buchanan soils.

This soil has moderate permeability and moderate to high available water capacity. Runoff is medium. In unlimed areas, the soil is strongly acid to very strongly acid throughout.

Most of the acreage of this soil is in crops; small areas are used as woodland and pasture. The soil has excellent potential for farming, and it is well suited to pasture and trees. The potential for homesites is good, but there are problems relating to onsite waste disposal. The soil is suited to most other nonfarm uses.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Crops respond well to fertilizer and good management. Growing cover crops, using crop residue, and including hay in the cropping system are ways to maintain the organic-matter content and good tilth of the soil. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that can be used to control erosion. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a very small acreage is wooded. Productivity is good. Management problems are slight. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses by a gravelly surface layer. There is a possibility of ground-water contamination if the soil is used for onsite waste disposal.

The Buchanan soils included in mapping have more limitations to use and management than the Murrill soil. Capability subclass IIe.

MuC—Murrill gravelly loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on the undulating dissected hills of the uplands adjacent to the limestone valleys. Slopes are generally smooth and concave. The areas are irregular in shape and are mainly 2 to 10 acres in size.

Typically, in a cultivated area, this soil has a surface layer of dark yellowish brown gravelly loam 8 inches thick. The subsoil extends to a depth of 80 inches. In sequence from the top, it is 6 inches of brown, friable gravelly loam; 6 inches of yellowish brown, friable gravelly silty clay loam; 11 inches of dark brown, firm gravelly silty clay loam; 29 inches of strong brown, firm gravelly sandy clay loam; and 20 inches of reddish brown, firm gravelly sandy clay loam.

Included with this soil in mapping are a few small areas of deep, well drained Hagerstown soils and scattered areas of moderately well drained Buchanan soils.

This soil has moderate permeability and moderate to high available water capacity. Runoff is medium. In unlimed areas, the soil is strongly acid to very strongly acid throughout.

Most areas of this soil are in crops, and small areas are used for woodland and pasture. The soil has excellent potential for farming, and it is well suited to pasture and trees. The potential for homesites is good, but the soil is somewhat limited for onsite waste disposal and most other nonfarm uses.

If this soil is used for cultivated crops, there is a severe hazard of erosion. Crops respond well to fertilizer and good management. Stripcropping, minimum tillage, diversions, and sod waterways are some practices that help control erosion. Growing cover crops, using crop residue, and including hay in the cropping system are ways to maintain the organic matter content and good tilth of the soil. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops, such as potatoes.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a small acreage is wooded. Productivity is good. Management problems are few, and they are related to slopes. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses by slope. There is a possibility of ground-water contamination if this soil is used for onsite waste disposal.

The Buchanan soils included in mapping have more limitations to use and management than the Murrill soil. Capability subclass IIIe.

Ne—Newark silt loam. This is a deep, poorly drained and somewhat poorly drained, nearly level soil on flood plains, mainly along major streams in the limestone areas. The areas are irregular in shape and normally range from 2 to 5 acres in size.

In a typical profile this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 21 inches. The upper 5 inches is yellowish brown, firm silt loam; and the lower 8 inches is gray, heavy silt loam. The substratum is gray, firm silt loam in the upper 29 inches, and it is brown, loose gravelly loamy sand to a depth of 60 inches.

Included with this soil in mapping are small areas of moderately well drained Philo soils and poorly drained Melvin soils.

This soil is moderately permeable, and the available water capacity is high. Reaction is medium acid to mildly alkaline throughout where the soil is unlimed. A high water table is within 12 inches of the surface for a large part of the year. Runoff is slow. The rooting depth is restricted by the high water table.

Most areas of this soil are used for permanent pasture. If properly drained, the soil can be used occasionally for row crops. It has good potential for growing trees. The high water table and flooding limit its potential for most nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in spring, and crops may be damaged by floodwaters following intensive rainfall. Excess surface water can be drained away by keeping natural drainageways open or by using open drains where outlets are available.

The soil has good potential for pasture. Grazing of pasture when the soil is wet and overgrazing are the major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Stocking at proper rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to moisture-tolerant trees, but a very small acreage is wooded. Potential productivity is good, but the rooting depth is restricted by the high water table. Use of equipment is restricted during much of the year because of the high water table. Machine planting of trees in large areas is practical.

This soil is severely limited for most nonfarm uses because of the high water table and flooding. It has some potential for wildlife and recreational uses.

The soils included in mapping are also limited by flooding for most uses. The Philo soils are better drained than this Newark soil, and wetness is not so serious a problem. Capability subclass IIw.

No—Nolin silt loam. This is a nearly level, well drained soil in depressional areas in the limestone valley. The areas are irregular in shape and normally range from about 2 to 3 acres in size.

In a typical profile in a cultivated area, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches. The upper 16 inches are dark yellowish brown, friable silt loam, and the lower 34 inches are brown, friable silt loam.

Included in mapping are small areas of somewhat poorly drained soils. Also included are small areas with 20 to 40 inches of alluvium derived from glacial material over soil material derived from limestone.

This well drained soil has moderate permeability and high available water capacity. Where unlimed, the soil is neutral to slightly acid throughout. Runoff is medium.

This soil has good potential for farming and is used mainly for row crops. It has good potential for pasture and for woodland. Frequent flooding is the major limitation for nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Also, stripcropping can be used where the topography is suitable. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable selection of plants, and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

A few small areas of this soil are wooded, and productivity is good. Management problems are few and are mostly related to flooding. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of frequent flooding of short duration. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The somewhat poorly drained soils included in mapping are wetter and more limited in use and management than this Nolin soil. Capability subclass I.

OpB—Opequon silty clay loam, 3 to 8 percent slopes. This gently sloping, shallow, well drained soil is in the limestone valley, mainly on low ridges. The areas are irregular in shape and range in size from 2 to 40 acres.

Typically, where this soil has been cultivated, the surface layer is dark brown, silty clay loam about 8 inches thick. The subsoil extends to a depth of 16 inches. The upper 4 inches is yellowish red, firm silty clay; the next 4 inches is red, firm clay. Impure limestone bedrock is at a depth of 16 inches.

Included in mapping are small areas of well drained Hagerstown soils. Also included are small scattered areas of Rock outcrop.

This shallow, well drained soil has moderate to slow permeability and very low available water capacity. Where unlimed, the soil is medium acid to neutral. Runoff is medium. The rooting depth may be restricted by the bedrock.

This soil has fair potential for farming and is used mainly for crops. It has good potential for pasture and for woodland, and it is limited for some nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. In places, bedrock hinders the con-

struction of diversions. Incorporating some crop residue and manure into the surface layer will help maintain organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates, to maintain a desirable plant population, and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

Very few areas of this soil are wooded. Productivity is fair to good, but the rooting depth may be restricted by limestone bedrock. A major management problem is tilling at the right content of soil moisture. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because it is shallow to limestone bedrock and has moderately slow to slow permeability. The shallowness is a limitation for the onsite disposal of waste and for excavating for buildings. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The scattered rock outcrops included in mapping lack soil cover and present serious problems for use and management of the surrounding soil. Capability subclass IIIe.

OpC—Opequon silty clay loam, 8 to 15 percent slopes. This sloping, well drained, shallow soil is on low ridges in the limestone valleys of the survey area. Slopes are smooth and concave. The areas are elongated in shape and range from about 2 to 30 acres in size.

In a typical profile the surface layer is dark brown silty clay loam about 8 inches thick. The subsoil is yellowish red, firm silty clay in the upper 4 inches and red, firm clay in the lower 4 inches. Bedrock is at a depth of 16 inches.

Included in mapping are small areas of deep, well drained Hagerstown soils. Also included are small areas of Rock outcrop.

This well drained soil has moderate to slow permeability and very low available water capacity. Where unlimed, the soil is medium acid to neutral throughout. Runoff is medium. The rooting depth may be restricted by the bedrock.

This soil has fair potential for cultivated crops and is used mainly for crops and pasture. It has fair potential for pasture. The potential for woodland is good, but there are limitations for most nonfarm uses.

If this soil is used for cultivated crops, the very severe hazard of erosion needs to be considered. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Also, stripcropping can be used where the topography is suitable. In places, bedrock hinders the construction of diversions. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility must be maintained through periodic applications of nutrients.

A few acres of this soil are wooded. Productivity is fair to good, but the rooting depth may be restricted by limestone bedrock. A major management problem, imposed by the very low available water capacity, is seedling mortality. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, depth to limestone bedrock, and moderate to slow permeability. The shallowness to the underlying rock is a limitation for onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The Hagerstown soils included in mapping are deeper to bedrock and have fewer limitations to use and management than this Opequon soil. Capability subclass IVe.

OpD—Opequon silty clay loam, 15 to 25 percent slopes. This moderately steep, well drained, shallow soil is on the sides of low ridges in the limestone valleys of the survey area. Slopes are smooth and concave. The areas are elongated in shape and range from about 2 to 30 acres in size.

Typically, where this soil has been cultivated, the surface layer is dark brown silty clay loam about 8 inches thick. The subsoil, which extends to a depth of 16 inches, is yellowish red, firm, silty clay in the upper part, and it is red, firm clay in the lower part. Bedrock is at a depth of 16 inches.

Included in mapping are small areas of deep, well drained Hagerstown soils. Also included are small areas of Rock outcrop.

This well drained soil has moderate to slow permeability and very low available water capacity. Where unlimed, the soil is medium acid to neutral throughout. Runoff is rapid. The rooting depth may be restricted by the bedrock.

This soil has poor potential for cultivated crops. It is used mainly for pasture, and some areas are in woodland. It has fair potential for pasture. Potential for woodland is good. This soil is limited for some nonfarm uses.

This soil is too steep and erodible for cultivated crops. It is better suited to pasture and woodland. Further erosion will result in a shallower rooting depth and lower available water capacity.

If this soil is used for pasture, management should include proper stocking rates to help maintain a desirable selection of plants and rotation grazing. For optimum production, soil fertility should be maintained through periodic applications of nutrients.

Some of the areas of this soil are wooded. Productivity is fair to good, but rooting depth may be restricted by limestone bedrock. A major management problem is seedling mortality, imposed by the very low available

water capacity. The moderately steep slopes limit equipment selection. Machine planting of trees in large areas is generally practical. Roads constructed during harvesting should be on the contour to reduce erosion.

This soil is limited for nonfarm uses because of slope, depth to limestone bedrock, and moderate to slow permeability. If this soil is used for onsite disposal of waste, ground-water contamination is a possibility. Excavating for buildings is also a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment.

The Hagerstown soils included in mapping are deeper to bedrock and have fewer limitations for use and management than this Opequon soil. Capability subclass VIe.

ORF—Opequon-Hagerstown complex, steep. This steep, well drained soil complex is on the sides of undulating dissected hills in the limestone valleys of the uplands. Slopes are generally 400 to more than 1,000 feet in length. The areas are mainly irregular in shape and range from 2 to 60 acres in size. The Opequon soils make up about 65 percent of the complex, and the Hagerstown soils make up 20 percent.

In a typical profile the Opequon soils have a dark brown, silty clay loam surface layer about 8 inches thick. The subsoil to a depth of 12 inches is yellowish red, firm silty clay, and to a depth of 16 inches it is red, firm clay. Bedrock is at a depth of 16 inches.

In a typical profile the Hagerstown soils have a dark yellowish brown, silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 6 inches is strong brown, firm silt loam; the next 4 inches is strong brown, firm silty clay loam; and the next 42 inches is yellowish red, firm silty clay.

Because of the steep slopes, these soils have not been investigated as thoroughly as other soils in the survey area. Included with these soils in mapping are a few small areas of very shallow soils and rock outcrop. Limestone bedrock is at the surface in a number of places.

These soils have moderate to slow permeability and high to very low available water capacity. Where unlimed, they are neutral to medium acid. Runoff is rapid. The rooting depth may be restricted by the variable depth to limestone bedrock. These soils have very poor potential for farming and are used mainly for woodland. They have poor potential for most nonfarm uses.

Nearly all of the acreage is in woodland, and woodland production is good. Rooting depth may be restricted by bedrock, and the steep and very steep slopes limit the selection of equipment.

These soils are limited for nonfarm uses because of slope, depth to bedrock, and moderate to slow permeability. The slope and depth to bedrock are problems in excavating for buildings and are serious limitations for onsite waste disposal. If these soils are disturbed for construction, management practices are needed to control erosion.

The soils included in mapping have more serious limitations to use and management than the Opequon and Hagerstown soils. Capability subclass VIIe.

Pe—Penlaw silt loam. This is a nearly level, somewhat poorly drained soil in small drainageways and depressions in the limestone valleys. Slopes are generally smooth and concave. The areas are elongated in shape and range from about 2 to 3 acres in size.

In a typical profile the surface layer is brown silt loam about 11 inches thick. The subsoil extends to a depth of 45 inches. The upper 8 inches is light brownish gray, firm silty clay loam; the next 11 inches is brown, firm silty clay loam; and the lower 15 inches is yellowish brown, firm light silty clay loam. The substratum to a depth of 69 inches is yellowish brown, firm silty clay.

Included with this soil in mapping are a few areas of deep, moderately well drained soils and a few areas of poorly drained Melvin soils.

This soil has slow permeability and high available water capacity. Runoff is slow. The subsoil has a firm and brittle fragipan. A water table is within 6 to 18 inches of the surface for long periods during wet seasons. The rooting depth is restricted by the firm fragipan. In unlimed areas, the soil is neutral to medium acid throughout.

Most areas of this soil are used for crops. A few areas are used for pasture. The soil is best suited to grass and pasture but can be used for cultivated crops if properly managed. It has good potential for growing trees and limited potential for many nonfarm uses.

When this soil is used for cultivated crops, there is a slight hazard of erosion. Use of cover crops, and including grasses and legumes in the cropping system are practices that help maintain organic-matter content and good soil tilth. Diversions and covered drains are needed to help remove excess water and allow for timely tillage.

The soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a desirable selection of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management concerns.

The soil is suited to trees. A small acreage is naturally wooded, and many formerly cultivated but now idle areas are reverting to trees. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it is slowly permeable and has a seasonal high water table. There is a possibility of ground-water pollution if this soil is used for onsite disposal of waste. The seasonal high water table is also a hazard for buildings with basements. If buildings with basements are constructed on this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The soils included in mapping have similar limitations to use and management. Capability subclass IIIw.

Ph—Philo silt loam. This is a deep, nearly level, moderately well drained soil on flood plains along the major streams throughout the survey area. Slopes are generally smooth and concave. The areas are irregular in shape and range from about 2 to 4 acres in size.

In a typical profile the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 22 inches. The upper 5 inches is dark yellowish brown, friable silt loam; the lower 8 inches is brown, firm silt loam. The substratum extends to a depth of 60 inches or more. The upper 10 inches is gray, friable silt loam; the next 10 inches is gray, firm loam; and the lower 18 inches is stratified sand and gravel.

Included with this soil in mapping are a few areas of well drained Pope soils and a few areas of poorly drained Atkins soils.

This soil has moderate permeability, and the available water capacity is moderate to high. Runoff is slow. A seasonal high water table is within 18 to 36 inches of the surface for long periods during wet seasons. In unlimed areas, the soil is medium acid to very strongly acid throughout.

Most areas of this soil are used for crops. A few areas are in woodland. The soil is suited to grass and pasture and is suited to cultivated crops if properly managed. It has good potential for growing trees and limited potential for many nonfarm uses.

When this soil is used for cultivated crops, there is a slight hazard of erosion. Diversions and covered drains, where outlets are available, are needed to help remove excess water and allow for timely tillage. Growing cover crops, using crop residue, and including hay in the cropping system are ways to maintain the organic-matter content of the soil.

The soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a desirable balance of plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small acreage is naturally wooded, and many formerly cultivated but now idle areas are reverting to trees. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is limited for most nonfarm uses because it has a seasonal high water table and is subject to flooding. These are serious limitations for onsite disposal of waste and also potential hazards for construction of buildings.

Flooding also limits the use and management of the included Pope and Atkins soils. Capability subclass IIw.

Po—Pope soils. These are deep, nearly level, well drained soils on flood plains along the major streams throughout the survey area. Slopes are smooth and concave. The areas are irregular in shape and normally range from 2 to 4 acres in size.

In a typical profile the surface layer is dark brown fine sandy loam, loam, or silt loam about 8 inches thick. The subsoil extends to a depth of 45 inches. The upper 19 inches is brown, friable fine sandy loam; the lower 18 inches is dark yellowish brown, very friable fine sandy loam. The substratum to a depth of 85 inches is dark yellowish brown, friable gravelly fine sandy loam.

Included in mapping are small areas of moderately well drained Philo soils. Also included are small areas of poorly drained Atkins soils.

These well drained soils have moderate to moderately rapid permeability and moderate available water capacity. Where unlimed, they are strongly acid to very strongly acid throughout. Runoff is slow.

These soils have excellent potential for farming and are used mainly for crops. They have good potential for pasture and excellent potential for woodland. Common flooding is the major limitation for most nonfarm uses.

When these soils are used for cultivated crops, there is a slight hazard of erosion. Crops may be damaged by floodwater following periods of extremely intensive rainfall. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content and reduce the tendency of the soils to clod and crust.

If these soils are used for pasture, management should include proper stocking rates to maintain a selection of desirable plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients. Livestock should be removed from these soils when floodwater is expected.

A few areas of these soils are wooded, and productivity is excellent. Management problems are few and are mostly related to common flooding. Machine planting of trees in large areas is generally practical.

These soils are limited for nonfarm uses because of common flooding. Flooding is a serious limitation for onsite disposal of waste and for homesites.

There are additional limitations to the use and management of the included Philo and Atkins soils. Capability class I.

Pu—Purdy silt loam. This is a deep, poorly drained to very poorly drained, nearly level soil on high bottoms and stream terraces. The areas are irregular in shape and range from 2 to 5 acres in size.

In a typical profile this soil has a dark grayish brown, silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 40 inches. The upper 10 inches is gray, firm silty clay loam; the lower 21 inches is dark gray, firm silty clay. The substratum to a depth of 60 inches is gray, firm silty clay.

Included with this soil in mapping are small areas of somewhat poorly drained Tyler soils.

This soil is slowly to very slowly permeable, and the available water capacity is high. Reaction is strongly acid to extremely acid throughout where the soil is unlimed. A high water table is within 6 inches of the surface during a large part of the year. Runoff is slow. The rooting depth is restricted by the high water table.

Most areas of this soil are used for permanent pasture. If properly drained, this soil can be used occasionally for row crops. It has fair potential for growing trees. The high water table and flooding limit its potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in spring. Crops may be damaged by floodwaters following intensive rainfall. Excess surface water can be drained away by keeping natural drainageways open or by using open drains where outlets are available.

The soil has fair potential for permanent pasture. Grazing of pasture when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a selection of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to moisture-tolerant trees, and a small acreage is wooded. Potential productivity is fair, but the rooting depth is restricted by the high water table. Use of equipment is restricted for a large part of the year because of the high water table. Machine planting of trees in large areas is practical.

This soil is limited for most nonfarm uses because of the high water table and flooding, especially for homesites and onsite waste disposal. The soil has some potential for wildlife and recreational uses.

Limitations in use and management of the included Tyler soils are similar to those of the Purdy soil. Capability subclass IVw.

Ru—Rubble land. This is a miscellaneous area on ridgetops and side slopes and in narrow gaps between the high ridges made by water cutting across them. Slopes range from about 2 percent to 60 percent or more. The areas are elongated in shape on sides of ridges and irregular on ridgetops, and they range from 2 to more than 10 acres in size.

This map unit consists of a mass of rock fragments with very little soil material in the voids between the fragments. The thickness of the mass of rock material is variable.

Included in mapping are small areas of extremely stony soils. Also included are small areas of exposed bedrock. This miscellaneous area is too stony and bouldery for nearly all uses. Most areas are idle or support a few scattered, poor quality trees or shrubs, but none of economic importance.

This map unit is too stony for cultivated crops, pasture, and woodland (fig. 5). It is also unsuited to nonfarm uses. It has some potential for wildlife and recreational uses. Capability subclass VIIIs.

Ty—Tyler silt loam. This is a deep, somewhat poorly drained, nearly level soil on stream terraces and high bottoms mainly along the major rivers and streams of the survey area. The areas are irregular in shape and range from 2 to 5 acres in size.

In a typical profile this soil has a grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 46 inches. The upper 6 inches is yellowish brown, firm silt loam; the next 6 inches is light brownish gray, firm heavy silt loam; and the lower 25 inches is light gray, firm silt loam. The substratum to a depth of 60 inches is gray, firm loam.

Included with this soil in mapping are small areas of moderately well drained Monongahela soils and poorly drained Purdy soils.

This soil is slowly to very slowly permeable, and the available water capacity is moderate. Reaction is strongly acid to extremely acid throughout the surface layer and subsoil where the soil is unlimed. The soil has a seasonal high water table within 6 to 18 inches of the surface during a large part of the year. Runoff is slow. The rooting depth is restricted by the seasonal high water table.

Most areas of this soil are used as grassland. If properly drained, this soil can be used occasionally for row crops. It has good potential for growing trees but limited potential for many nonfarm uses.

If this soil is used for cultivated crops, there is a slight hazard of erosion. Excess water causes the soil to warm slowly in the spring. Drainage can be improved by keeping natural drainageways open or by constructing open drains where outlets are available.

The soil has good potential for pasture. Grazing of pasture when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a selection of desirable plants, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to trees, but only a small acreage is wooded. Potential productivity is very good, but the rooting depth is restricted by the seasonal high water table. Use of equipment is restricted during a large part of the year because of the seasonal high water table. Machine planting of trees in large areas is practical.

This soil is seriously limited for most nonfarm uses, especially building sites and onsite waste disposal, because of the seasonal high water table and slow to very slow permeability. The soil has some potential for wildlife and recreational uses.

The included Monongahela and Purdy soils have similar limitations to use and management. Capability subclass IIIw.

VaC—Vanderlip loamy sand, 5 to 15 percent slopes. This gently sloping to sloping, well drained soil is on ridgetops and side slopes of the dissected uplands. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and normally range from 2 to 10 acres in size.

In a typical profile the surface layer is very dark grayish brown loamy sand about 3 inches thick. It is underlain by a subsurface layer of yellowish brown, very friable loamy sand which extends to a depth of 20 inches. The

subsoil, which extends to a depth of 56 inches, is light yellowish brown, loose loamy sand. The substratum to a depth of 76 inches is yellowish brown, friable very gravelly loamy sand.

Included in mapping are small areas of deep, well drained Morrison soils. Also included are small areas of moderately deep Dekalb soils.

This well drained soil has rapid permeability and low to moderate available water capacity. Where unlimed, the soil is very strongly acid to medium acid throughout. Runoff is medium.

This soil has fair potential for farming and is used mainly for cultivated crops. It has fair potential for pasture and for woodland. It has limitations for some nonfarm uses.

If this soil is used for cultivated crops, the moderate hazard of erosion needs to be considered. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. Incorporating some crop residue and manure into the surface layer will help maintain organic matter content.

When this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients.

A few areas of this soil are wooded. Productivity is fair, but growth may be restricted by the low to moderate available water capacity. A major management problem is seedling mortality caused by the low to moderate available water capacity. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, coarse texture, and rapid permeability. It is suited to use as building sites, but if it is disturbed for construction, management practices are needed to control erosion and sediment. Because of the rapid permeability, there is a hazard of ground-water contamination if the soil is used for disposal of waste.

The Dekalb soils included in mapping are moderately deep and have greater problems of use and management than this Vanderlip soil. Capability subclass IVs.

WaB—Watson gravelly silt loam, 2 to 8 percent slopes. This nearly level to gently sloping, moderately well drained soil is at the base of secondary ridges and in the valleys of the dissected uplands. Slopes are generally 400 to 1,000 feet in length and are mainly smooth and concave. The areas are oval to elongated in shape and range from 2 to more than 5 acres in size.

In a typical profile the surface layer is dark brown, friable gravelly silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 5 inches is yellowish brown, firm gravelly silt loam; the next 5 inches is strong brown, firm gravelly heavy loam; the next 10 inches is yellowish red, firm gravelly silty clay loam; and the lower 32 inches is yellowish red, firm and brittle gravelly heavy loam. Depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of well drained Allenwood soils. A few scattered areas of somewhat poorly drained Alvira soils are also included.

This soil has slow permeability, and the available water capacity is moderate. Runoff is medium. The subsoil has a firm and brittle fragipan. A water table is within 18 to 30 inches of the surface for long periods during wet seasons. The rooting depth is restricted by the fragipan. In unlimed areas, the soil is very strongly acid or strongly acid throughout.

Most of the acreage of this soil is used for general farm crops. This soil is best suited to that use. It has good potential for growing trees and limited potential for many nonfarm uses. A few small areas are in woodland.

If this soil is used for cultivated crops, there is a moderate hazard of erosion. Minimum tillage, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Diversions and covered drains are needed to help remove excess water and allow for timely tillage. The gravelly surface layer may interfere with the seeding and harvesting of some crops.

The soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Proper stocking rates to maintain a desirable plants population, rotation grazing, deferred grazing, and restricted grazing during wet periods are the chief management needs.

The soil is suited to trees. A small acreage is naturally wooded, and some formerly cultivated but now idle areas are reverting to trees. Pruning undesirable trees increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the larger areas.

This soil is somewhat limited for most nonfarm uses because it is slowly permeable and has a seasonal high water table. These are limitations for the onsite disposal of waste as well as for buildings with basements. If buildings with basements are constructed on this soil, foundation drains with proper outlets should be used to prevent seepage of water into the basements.

The Allenwood soils included in mapping have fewer limitations to use and management than this Watson soil. The included Alvira soils have more severe limitations related to wetness. Capability subclass IIe.

WaC—Watson gravelly silt loam, 8 to 15 percent slopes. This sloping, moderately well drained soil is on side slopes on secondary ridges and in the valleys of the dissected uplands. Slopes are generally 400 to 1,000 feet in length and are smooth and concave. The areas are irregular in shape and range from 2 to more than 5 acres in size.

Typically, where this soil has been cultivated, the surface layer is dark brown, friable gravelly silt loam about 8

inches thick. The subsoil is about 52 inches thick. The upper layer is yellowish brown, firm, gravelly silt loam about 5 inches thick; the next 5 inches is strong brown, firm gravelly heavy loam; the next 6 inches is yellowish red, firm gravelly silty clay loam; and the lower 36 inches is yellowish red, firm and brittle gravelly heavy loam. Depth to bedrock is more than 60 inches.

Included with this soil in mapping are small areas of well drained Allenwood soils. A few small areas of somewhat poorly drained Alvira soils are also included.

This moderately well drained soil is moderately permeable above the fragipan, but the fragipan is slowly permeable. The available water capacity is moderate. Where unlimed, the soil is very strongly acid or strongly acid. A seasonal high water table is within 18 to 30 inches of the surface during wet seasons. Runoff is medium. The rooting depth is restricted by the fragipan layer in the subsoil.

Most areas of this soil are used for cultivated crops; some small areas are used for pasture and woodland. The soil has good potential for farming and is well suited to pasture and tree growth. It has limited potential for many nonfarm uses.

When cultivated crops are grown, there is a moderate hazard of erosion. Some of the practices used to reduce runoff and control erosion are minimum tillage, use of cover crops, and including grasses and legumes in the cropping system. Where the topography is suitable, stripcropping can be used. Incorporating some crop residue into the surface layer can help maintain organic-matter content and reduce the tendency of the soil to clod and crust.

This soil has good potential for pasture. Overgrazing and grazing of pasture when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer will become compacted. Management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients.

The soil is suited to trees, but only a few areas are wooded. Although productivity is good, the rooting depth may be restricted by the fragipan. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting of trees is practical in the large areas.

This soil is somewhat limited for nonfarm uses because of slow permeability, slope, and the seasonal high water table. Slow permeability is a serious limitation for onsite waste disposal, and the seasonal high water table is a hazard for buildings with basements. Foundation drains with proper outlets are recommended for these types of buildings. During construction on this soil, management practices are needed to control erosion and sedimentation.

The Allenwood soils included in mapping have fewer limitations to use and management than this Watson soil. The Alvira soils have greater limitations because of wetness. Capability subclass IIIe.

WeB—Weikert shaly silt loam, 3 to 8 percent slopes. This sloping, shallow, well drained soil is on dissected uplands. Slopes are generally 400 to 1,000 feet in length. The areas are irregular in shape and normally range from 2 to 50 acres in size.

In a representative profile the surface layer is dark brown shaly silt loam about 7 inches thick. The subsoil extends to a depth of 14 inches and is yellowish brown, friable very shaly silt loam. The substratum is yellowish brown, friable very shaly silt loam. Dark gray shale bedrock is at a depth of 18 inches.

Included in mapping are small areas of moderately deep Berks soils. Also included are small scattered areas of a soil in which bedrock is within 10 inches of the surface.

This shallow, well drained soil has moderately rapid to rapid permeability and very low available water capacity. Where unlimed, the soil is strongly acid or very strongly acid throughout. Runoff is medium. The rooting depth is restricted by the depth to bedrock.

This soil has poor potential for farming and is used mainly for grassland and woodland. It has poor potential for pasture and fair potential for woodland. It has limitations for most nonfarm uses.

With proper management, this soil can be used for cultivated crops; however, production will be low. If it is used for cultivated crops, the hazard of erosion is moderate. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. In places, bedrock hinders the construction of diversions. Incorporating some crop residue and manure into the surface layer can help maintain organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients.

Many areas of this soil are wooded. Productivity is fair, but the rooting depth is restricted by the depth to shale bedrock. A serious management problem is seedling mortality caused by the very low available water capacity. Pruning undesirable trees can leave more available water for the desirable trees. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of bedrock and the coarse fragments in the soil. The shallowness to the underlying rock is a serious limitation for onsite disposal of waste and excavating for buildings. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The soils included in mapping have similar problems in use and management. Capability subclass IIIe.

WeC—Weikert shaly silt loam, 8 to 15 percent slopes. This sloping, shallow, well drained soil is on dissected uplands. Slopes are generally 400 to 1,000 feet in length. The areas generally are elongated in shape and range about 2 to 50 acres in size.

Typically, where this soil has been cultivated, the surface layer is dark brown shaly silt loam about 6 inches thick. The subsoil, which extends to a depth of 14 inches, is yellowish brown, friable very shaly silt loam. The substratum is yellowish brown, friable, very shaly silt loam. Dark gray shale bedrock is at a depth of 18 inches.

Included in mapping are small areas of moderately deep Berks soils. Also included are small scattered areas of a very shallow soil in which bedrock is within 10 inches of the surface.

This shallow, well drained soil has moderately rapid to rapid permeability and very low available water capacity. Where unlimed, the soil is strongly acid or very strongly acid throughout. Runoff is medium. The rooting depth is restricted by the depth to bedrock.

This soil has poor potential for farming and is used mainly for grassland and woodland. It has poor potential for pasture and fair potential for woodland. It has limitations for most nonfarm uses.

With proper management, this soil can be used for cultivated crops; however, production will be low. If it is used for cultivated crops, there is a hazard of erosion. Further erosion will result in a shallower rooting depth and lower available water capacity. Some of the practices used to reduce runoff and control erosion are minimum tillage, diversions, use of cover crops, and including grasses and legumes in the cropping system. Stripcropping can be used where the topography is suitable. In places, bedrock hinders the construction of diversions. Incorporating some crop residue and manure into the surface layer helps maintain the organic-matter content and reduce the tendency of the soil to clod and crust.

If this soil is used for pasture, management should include proper stocking rates to maintain a desirable selection of plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients.

Many areas of this soil are wooded, and productivity is fair. The rooting depth is restricted by the depth to the shale bedrock. A major management problem is seedling mortality caused by the very low available water capacity of the soil. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, depth to bedrock, and coarse fragments. The shallowness to the underlying rock is a serious limitation for the onsite disposal of waste, and excavating for buildings is a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sedimentation.

The soils included in mapping have similar problems for use and management. Capability subclass IVe.

WeD—Weikert shaly silt loam, 15 to 25 percent slopes. This moderately steep, well drained, shallow soil is on the sides of prominent and secondary ridges of the uplands. Slopes are generally 400 to more than 1,000 feet in length. The areas are generally elongated in shape and about 2 to 80 acres in size.

Typically, where this soil has been cultivated, the surface layer is dark brown shaly silt loam about 7 inches thick. The subsoil extends to a depth of 12 inches and is yellowish brown, friable, very shaly silt loam. The substratum, about 4 inches thick, is yellowish brown, friable, very shaly silt loam. Bedrock is at a depth of 16 inches.

Included in mapping are small areas of moderately deep Berks soils. Also included are small areas of a soil in which bedrock is within 10 inches of the surface.

This well drained, shallow soil has moderately rapid to rapid permeability and very low available water capacity. Where unlimed, the soil is strongly acid or very strongly acid throughout. Runoff is rapid. The rooting depth is restricted by the depth to bedrock.

This soil has poor potential for farming and is used mainly for grassland and pasture. It has fair potential for pasture and for woodland. It has limitations for most nonfarm uses.

This soil is too erodible in moderately steep areas to be used for cultivated crops. If it is used for cultivated crops, further erosion will result in a shallower rooting depth and a lower available water capacity.

This soil can be used for pasture if properly managed, but production will be low because of the very low available water capacity. If the soil is used for pasture, management should include proper stocking rates to maintain a desirable balance of plants and rotation grazing. For optimum production, the level of fertility should be maintained through periodic applications of nutrients. If disturbed for reseeding, the soil should be protected from erosion.

Many areas of this soil are wooded, and productivity is fair. The rooting depth is restricted by the depth to shale bedrock. A serious management concern is seedling mortality due to the very low available water capacity. Roads constructed during harvesting should be on the contour to reduce erosion. Machine planting of trees in large areas is generally practical.

This soil is limited for nonfarm uses because of slope, depth to bedrock, and coarse fragments. There is a possibility of ground-water pollution if the soil is used for the onsite disposal of waste. Also, excavating for buildings may be a problem. If this soil is disturbed for construction, management practices are needed to control erosion and sediment accumulation.

The soils included in mapping have similar problems of use and management. Capability subclass VIe.

Planning the use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

GERALD J. LATSHAW, State soil scientist and JOHN C. SPITZER, agronomist, Soil Conservation Service, assisted in preparing this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best adapted to the soil are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the predicted yields of the cultivated crops, hay, and pasture are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and needed practices for soils in the survey area to those in the agri-business sector—equipment dealers, drainage contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." When making plans for management systems for individual fields or farms, check the detailed information given in the description of each soil.

More than 135,000 acres in the survey area were used for crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total 22,500 acres were used for permanent pasture; 26,800 acres for row crops, mainly corn; 26,800 acres for close-grown crops, mainly wheat and oats; 32,100 acres for rotation hay and pasture; 10,600 acres in permanent hayland; 1,100 acres in orchard; and the rest for conservation use only or idle cropland.

The potential of the soils in Juniata and Mifflin Counties for increased production of food is good. About 49,000 acres of potentially good cropland is currently used as woodland and about 10,000 acres as pastureland. In addition to the reserve productive capacity represented by this land, food production could be increased considerably by applying the latest technology on all cropland in the survey area.

Soil erosion is the major management concern on the cropland and pastures of Juniata and Mifflin Counties. Allegheny, Allenwood, Edom, Hagerstown, Mertz, Morrison, and Murrill soils are potentially productive for crops and pasture, but the erosion hazard is moderate to very severe on slopes of more than 3 percent.

Loss of the surface layer through erosion is damaging in two ways. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Second, soil eroded from farmland is deposited as sediment in streams and reservoirs.

Loss of the surface layer is especially damaging to soils that have a clayey subsoil, such as the Edom and Hagerstown soils, and to soils that have a layer in or below the subsoil that limits root penetration. Preparing a good seedbed and tilling are difficult on the clayey spots that occur in many sloping fields because the original friable surface soil has been eroded away. Such spots are common on Hagerstown silty clay loam. Root penetration is restricted in the Buchanan, Ernest, Laidig, and Monongahela soils by a fragipan and in Berks, Klinesville, and Weikert soils by bedrock. Erosion also reduces productivity on soils that tend to be droughty, such as the Hazelton and Vanderlip soils.

Control of erosion reduces the pollution of streams by sediment and improves water quality for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide a protective surface cover, reduce surface water runoff, and increase the rate of infiltration. A cropping system that keeps vegetative cover on the soil for extended periods increases the productive capacity of the soils. On livestock farms, for example, the legume and grass forage crops in the cropping system not only provide pasture and hay but help reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

Slopes are so irregular that contour tillage or terracing is not practical in most areas of the sloping Allenwood, Edom, Hagerstown, and Millheim soils. On these soils, cropping systems that provide substantial vegetative cover are needed to control erosion. Additional soil protection is obtained by minimum tillage. Minimum tillage and leaving crop residues on the surface increase infiltration and reduce the erosion hazard. These practices can be adapted to most soils in the survey area. No tillage is particularly effective when growing corn on sloping soil. It is more difficult to practice no tillage successfully, however, on the soils that have a clayey surface layer and require careful management.

Terraces and diversions reduce the length of slope and thus reduce surface water runoff and erosion. They are most practical on deep, well drained soils that have regular slopes. Laidig, Mertz, and Murrill soils are generally suitable for terraces and diversions. Other soils are less suitable because of irregular slopes, excessive wetness in the terrace channels, a clayey subsoil which would be exposed in terrace channels, or bedrock at a depth of less than 40 inches.

Contour farming and stripcropping are common erosion control practices in the survey area. They are best adapted to soils with smooth, uniform slopes, including most areas of the sloping Buchanan, Elliber, Laidig, Mertz, and Murrill soils.

Information for the design of erosion control structures for each kind of soil is contained in the Technical Guide, available in local field offices of the USDA Soil Conservation Service.

Soil drainage is the major management need on about 10 percent of the acreage used for crops and pasture in the survey area. Some soils are naturally so wet that the crops common to the area generally cannot be produced without artificial drainage. These are the poorly drained Andover, Atkins, Brinkerton, Melvin, and Purdy soils, which make up about 41,000 acres in the survey area.

Some soils are so wet that crop damage results during most years unless they are artificially drained. In this category are the somewhat poorly drained Alvira, Evendale, Newark, Penlaw, and Tyler soils, which make up about 7,000 acres.

Some areas of wetter soils along drainageways and in swales are commonly included in areas of the moderately well drained Buchanan, Ernest, Kreamer, Monongahela, Philo, and Watson soils. Artificial drainage is needed in most of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of the poorly drained soils if they are intensively cropped. Drains have to be more closely spaced in the slowly permeable soils than in the more permeable soils. Finding adequate outlets for tile drains is often difficult in areas of Atkins, Melvin, and Purdy soils.

Soil fertility is naturally low in many soils in the survey area. Because many soils on uplands are naturally strongly acid, they require application of ground limestone to supply calcium and to raise the pH level sufficiently for good growth of alfalfa and other crops. The level of available phosphorus and magnesium is naturally low in most soils. Additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many soils used for crops in the survey area have relatively low organic-matter content. Generally, the structure of such soils is weak, and intense rainfall causes crusting of the exposed surface. The crust is hard when it is dry, and it is nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residues, manure, and other organic material can help to improve soil structure and to reduce crust formation.

Fall plowing is generally not advisable on the light colored soils that have a silt loam surface layer, because they crust during the winter and spring. Many of these soils are nearly as dense and hard at planting time as they were before they were plowed. Also, most of the cropland consists of sloping soils that are subject to damaging erosion if they are plowed in fall.

Tilth is a problem on the clayey Hagerstown and Edom soils because they tend to be cloddy and hard, and preparing a good seedbed is difficult. Fall plowing is a common practice on these soils.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn is the major row crop although grain sorghum, potatoes, tobacco, soybeans, and similar crops can be grown if economic conditions are favorable. Wheat, oats, and barley are the common close-growing crops.

Specialty crops grown commercially in the survey area are apples, vegetables, peaches, and nursery plants.

Deep soils that have good natural drainage and that warm up early in spring are best suited to specialty crops such as tree fruits. Good air drainage is needed to reduce frost damage when growing peaches and apples. In the survey area the Elliber, Mertz, Morrison, Murrill, and Vanderlip soils have the best combination of soil properties and air drainage for growing the tree fruits.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the soil is not suited to the crop or the crop is not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay (fig. 6) and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Woodland management and productivity

PAXTON G. WOLFE, woodland conservationist, Soil Conservation Service, assisted in preparing this section.

Juniata and Mifflin Counties originally had a dense cover of trees. However, clearing for housing and farming and for commercial purposes eliminated all of the virgin stands of timber. Now the commercial woodland, which occupies 63 percent of the land area, consists of second and third growth stands.

The following paragraphs describe principal forest cover types (*7*) that make up the present commercial woodland and the proportionate extent of each according to the Forest Service of the U. S. Department of Agriculture (*9*).

White pine forest makes up 1.6 percent of the total woodland. Fifty percent or more of the stand is eastern white pine, and the rest is mainly yellow-poplar, northern red oak, and white oak.

Elm, ash, and red maple forest makes up 4.0 percent of the total woodland. White ash, American elm, and red maple are the dominant species in the stand. Associated species are slippery elm, yellow birch, blackgum, sycamore, and hemlock.

Maple, beech, and birch forest makes up 6.3 percent of the total woodland. Sugar maple, beech, and yellow birch are the major species in the stand. Associated species are basswood, red maple, hemlock, northern red oak, ash, white pine, black birch, and yellow-poplar.

Aspen and birch forest makes up 0.2 percent of the total commercial woodland. Quaking aspen, bigtooth aspen, paper birch, and gray birch are dominant in the stand. Associated trees are pin cherry, red maple, yellow birch, white pine, ash, and sugar maple.

Virginia pine and pitch pine forest makes up 1.0 percent of the total commercial woodland. Virginia pine and pitch pine are the dominant species. Associated species include northern red oak, black oak, chestnut oak, scarlet oak, blackgum, and hickories.

Oak and hickory forest makes up 84.1 percent of the total commercial woodland. White oak, red oak, and hickory are the dominant trees in the stand. The principal associated trees are yellow-poplar, shagbark hickory, white ash, red maple, beech, and blackgum with an understory of flowering dogwood.

Other oak types make up 2.8 percent of the total commercial woodland.

Most of the commercial forest land is privately owned. At the time when this survey was made farmers owned 29.6 percent, other private sources 43.2 percent, forest industry 2.3 percent, Pennsylvania Game Commission 4.4 percent, and the Pennsylvania Department of Environmental Resources, Bureau of Forestry, 20.5 percent.

Sawtimber makes up approximately 60.6 percent of the acreage in commercial forests, poletimber 33.8 percent, seedlings and saplings 5.4 percent, and the remaining 0.2 percent is classified nonstocked.

A landowner can encourage the more desirable species of trees to grow in his woodlands by using good woodland management. Help in planning a program of woodland improvement can be obtained from local service foresters of the Pennsylvania Department of Environmental Resources, Bureau of Forestry. How much effort the landowner is willing to make toward improving his woodlands probably depends on general economic conditions.

The returns from soils which are rated excellent, very good, and good growing sites will generally justify the expenditure of money for management purposes. However, consideration should be given to the potential yield, quality of the particular species growing on the site, and the market potential. The species and proportion of poor quality stems growing on such sites may prohibit the investment of money for management. Also, the conversion of such areas from their present state to commercial woodland may not be economically justifiable.

Soils which are only fair growing sites are the most difficult to appraise for management. A thorough appraisal of the woodland for species and quality on the site is essential. Also, the market possibility should be investigated. A proper analysis of all of these interrelated factors is essential to determine the intensity of management that is justified.

Intensive management of the soils which are poor growing sites generally is not economically justified. However, woodland is in many cases the most practical use for these soils because they have equally unfavorable characteristics for cropland or grassland. Although returns may be slight to none for woodland with a poor site quality rating, this land use may be the most economical.

Table 7 contains information useful to woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, d, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Engineering

LLOYD E. THOMAS, assistant state conservation engineer, Soil Conservation Service, assisted in preparing this section.

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas

of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* (fig. 7) referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, and *poor*, which mean about the same as *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a sep-

tic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. Where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

If it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction material. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 10 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low frost action potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can restrict plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils or very firm clayey soils; soils that have suitable layers less than 8 inches thick; soils that have large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

CLAYTON HEINEY, JR. wildlife biologist, Soil Conservation Service, assisted in preparing this section.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Clayton Heiney, Jr., wildlife biologist, Soil Conservation Service assisted in preparing this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considera-

tions. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are broomsedge, goldenrod, beggarweed, and deertongue.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of hardwood trees and shrubs are oaks, aspen, cherries, apples, hawthorns, dogwoods, sassafras, sumac, hickory, black walnut, grape, viburnums, blueberry, blackberry, and briers. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are autumn-olive and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, hemlock, and red cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, barnyardgrass, bulrushes, sedges, and cattail.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, woodchuck, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, woody understory plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture (*8*). These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and in plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field

checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock (fig. 8) is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Laboratory soil characterization

Associate professors E. J. CIOLKOSZ, R. L. CUNNINGHAM, G. W. PETERSEN, R. PENNOCK, JR. and Professor R. P. MATELSKI, Agronomy Department, The Pennsylvania State University prepared this section.

Laboratory soil characterization, as an adjunct to field observation, measures soil properties useful in studying soil-forming processes, in interpreting land-use potentials and limitations, and in classifying pedons and soil series. The factors influencing soil formation may vary independently; consequently, soils may vary within seemingly uniform environments. Detailed studies which include laboratory analyses are necessary to help understand these relationships. The soil characterization studies in Juniata and Mifflin Counties add to the soils information previously collected and are particularly applicable to south-central Pennsylvania where additional characterization studies are in progress.

Thirteen sites were sampled, representing five of the 36 soil series that occur in Juniata and Mifflin Counties. Five of these soils, Edom silty clay loam (pedon 34-1), Elliber very cherty loam (pedon 34-12), Mertz cherty silt loam (pedon 34-11), Kreamer cherty silt loam (pedon 34-6), and Evendale cherty silt loam (pedon 34-5), were selected to illustrate the characterization studies in the following paragraphs. Edom soils are in the valleys; Elliber soils are on secondary ridges in the valleys; Mertz soils formed in colluvium on the upper side slopes of secondary ridges; and Kreamer and Evendale soils are downslope from Mertz soils.

The detailed profile descriptions and laboratory data for the 13 pedons can be obtained from the Pennsylvania Agricultural Experiment Station. Request sample number S70PA followed by the appropriate pedon number (*4, 6*).

Sampled pedons other than those described in this section are Edom 34-2 and 34-4, Mertz 34-3 and 34-10, Kreamer 34-7 and 44-2, Evendale 34-8, and Elliber 44-1. Analyses available for these pedons are as follows:

Chemical analyses of extractable cations, extractable acidity, extractable alluminum, water pH, 1N potassium chloride pH, 0.01 M calcium chloride pH, organic carbon, and organic nitrogen.

Physical analyses of coarse fragments distribution, particle size distribution, bulk density of fine earth plus coarse fragments, bulk density of fine earth (less than 2mm), 1/3 Atm moisture, and coefficient of linear extensibility.

Mineralogical analyses of kind of clay minerals and amount of clay minerals.

The following interpretive discussion pertains to those generalized data.

Clay content. The amount of clay is an indicator of physical and chemical reactive properties of the soil. Clay contributes to soil plasticity, shrink-swell potential, and cation exchange capacity (see discussion of nutrients for explanation of cation exchange capacity). Total water held in the soil increases with increasing clay content; however, water available to plants does not necessarily increase. Clay is a mobile component in soils and moves downward with percolating water. The extent of this translocation often reveals the state or degree of soil development. Many soils contain relatively low amounts of clay in the surface layer, higher amounts in the 25 to 75 centimeter (10 to 30 inch) zone, and then lower amounts below 100 centimeters (40 inches). The clay-enriched zone is designated as an argillic horizon, a key feature in studies of soil formation. For further information refer to the formation and classification section of this report.

The curves of figure 9 illustrate the clay distribution in pedons representative of the five series. The contrasting curves indicate that the five soils chosen represent different amounts of clay movement as well as different total amounts of clay. The depth of soil is closely approximated by the length of the curve, because samples were collected and analyzed from pits dug to bedrock or to approximately 2 meters (80 inches). The Elliber, Mertz, Kreamer, and Evendale soils represent a toposequence, in which the total clay content in the soils tends to increase downslope. This occurs because a greater proportion of shale and limestone material was incorporated into the colluvium from the underlying bedrock as the colluvium was deposited further downslope. In Kreamer, Evendale,

and Edom soils, clay distributions show prominent maxima related to the argillic horizon. The Elliber and Mertz data show less prominent clay increases with depth.

Coarse fragments. Particles more than 2 millimeters in diameter are not included in chemical, mineralogical, and some physical analyses and are called coarse fragments. Figure 10 shows the percentage of fragments in the total soil material.

Soils with high amounts of coarse fragments are less desirable for most uses. High amounts of fragments, such as the more than 60 percent that occurs in the Elliber pedon and in the lower horizons of the other pedons, dilute the effectiveness of the fine earth portion of the soil. For example, if a horizon is 50 percent fragments, only one-half of the soil mass is available to store water and nutrients. Thus, a soil that is 100 centimeters (40 inches) to bedrock and has 50 percent coarse fragments, has the same water and nutrient storage capacity as a soil that is 50 centimeters (20 inches) to bedrock and has no fragments (all other factors equal).

Surface fragments dissipate some of the energy of raindrops; therefore, soils with moderate amounts of coarse fragments on the surface tend to resist erosion. Percolation of water through the soil is often greatest where the most coarse fragments occur.

The coarse fragments in the Edom soils are primarily limestone and shale; those in the Elliber soils are chert and some sandstone; and those in the Mertz, Kreamer, and Evendale soils are chert and shale. In the Edom pedon, except in the fourth horizon, the content of coarse fragments tends to increase with depth. This is expected in a residual soil, there is a decreased intensity of weathering from the surface downward. The other four soils show a similar trend, although the Mertz, Kreamer, and Evendale soils formed in colluvium.

Available water capacity. Available water capacity is an approximation of the water retained by a soil that plants can use. The total amount held available for roots is primarily dependent upon soil depth, texture, and coarse fragment content. Most plant roots are in the upper 100 centimeters (40 inches) of the soil, and because all five of these soils are deep (greater than 100 centimeters to bedrock), soil depth is not a limiting factor in available water capacity. Figure 11 shows that, in general, the total available water decreases with depth in these soils. This results from higher coarse fragment content in the lower part of these profiles. In general, the Edom, Mertz, and Elliber soils have more available water than the Kreamer and Evendale soils. In the Edom soils this is due to the low coarse fragment content and a relatively high porosity in the upper horizons. The Mertz pedon, and more particularly, the Elliber pedon have a high coarse fragment content, but because of their high silt and very fine sand content, they retain a large amount of available water. The higher clay content and apparent low porosity of the Kreamer and Evendale pedons restrict their water holding capacity. In the Kreamer and Evendale pedons this limitation is less important because these soils are saturated with water for extended periods of the year, and the excess water is more of a problem than their low water holding capacity.

Nutrients. An indication of the nutrient-holding capacity of the soil is the laboratory-measured cation exchange capacity of the fine earth. The active mineral soils material is less than 0.002 millimeter in diameter (designated clay), and trends in exchange capacity are usually shown by the trends in clay percentages. Organic matter also contributes to cation holding capacity, and the highest capacity is in the horizons that contain the most organic matter. Surface horizons of the soils characterized have about 15 milliequivalents of exchange capacity per 100 grams of soil. Subsoil horizons have decreasing exchange capacities except where the clay content increases substantially.

Soils are acid or basic depending upon the basic cation content of the exchange complex. When the cation exchange capacity of the clays and organic matter in a soil is dominated by hydrogen and aluminum ions, the soil is acid and pH is low. Conversely, the pH is high and the soil is neutral to mildly alkaline or moderately alkaline when the complex is occupied mostly by basic ions, primarily calcium. The humid temperate climate in Juniata and Mifflin Counties leads to depletion of the basic soil cations (calcium, magnesium, sodium, and potassium) through leaching. Figure 12 illustrates the changes in total exchangeable bases (calcium, magnesium, sodium and potassium) with depth for the five characterized soils. The amount of exchangeable bases gives an indication of the nutrient status of these soils. Edom and Evendale soils contain moderate amounts of bases throughout the profile and the Kreamer, Mertz, and Elliber soils have lower amounts. All the soils are relatively high in total bases in the upper horizons because lime has been added to the surface layer. The Edom pedon is high in bases because there is a large amount of limestone and calcareous shale in its parent material; however, the high amount of bases in the Evendale pedon is the result of less efficient leaching or additions of high lime drainage waters to these soils (*3*).

Clay Minerals. Illite is the dominant mineral in the Edom silty clay loam. Some conversion of illite to vermiculite has taken place in the surface horizons, but this conversion has not extended deep enough into the profile to change this soil's mineralogical classification from illitic to mixed mineralogy. The Elliber soil shows considerably more conversion of illite to vermiculite in the upper part of the profile than the Edom soil, although lower horizons are comparable in illite content to the Edom soil. The mineralogy of the Mertz, Kreamer, and Evendale soils is similar to that of the Elliber soil, although in general they show less conversion of illite to vermiculite. These soils also show some abrupt changes with depth due to the textural heterogeneity of their colluvial parent material, and there are some buried soils in places (*3*).

The soil characterization data from Juniata and Mifflin Counties as well as soil characterization data from other

counties for soils in these two counties provide the basis for many of the soil and land-use interpretations presented in this survey.

Classification of the soils

This section describes the soil series of the survey area, defines the current system of classifying soils, and classifies the soils of the area according to that system.

Soil series and morphology

On the following pages each soil series in the survey area is described in detail. The series descriptions are presented in alphabetic order by series name.

For each series, some facts about the soil and its parent material are presented first. Then a pedon, a small three dimensional area of soil typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*8*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series mapped in this survey area. In the last paragraph the series is compared with similar soil series and with nearby soil series. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Allegheny series

The Allegheny series consists of fine-loamy, mixed, mesic Typic Hapludults. The soils are deep and well drained. They have a loam Ap horizon and a dark brown heavy loam and yellowish brown clay loam Bt horizon. The Allegheny soils are on old stream terraces. They formed in old alluvium weathered mainly from sandstone, siltstone, and shale. Slope ranges from 2 to 8 percent.

Allegheny soils are associated on the landscape with the moderately well drained Monongahela soils, the somewhat poorly drained Tyler soils, and the poorly drained Purdy soils.

Typical pedon of Allegheny loam, 2 to 8 percent slopes, in a cultivated field on the east side of South Granville Road, 3/4 mile from intersection with Pennsylvania Highway 103.

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) loam; moderate fine granular structure; friable, nonsticky and nonplastic; many small grass roots; slightly acid; abrupt smooth boundary.

B1—9 to 16 inches; strong brown (7.5YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable, slightly sticky and plastic; many small grass roots; slightly acid; clear wavy boundary.

B21t—16 to 23 inches; dark brown (7.5YR 4/4) heavy loam; moderate medium subangular blocky structure; friable, sticky and plastic; few small grass roots; common thin clay films on ped faces; common black coatings on ped faces; strongly acid; clear wavy boundary.

B22t—23 to 40 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm, sticky and plastic; few small grass roots; common thin clay films on ped faces; common black coatings on ped faces; strongly acid; clear wavy boundary.

C—40 to 67 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; very firm, sticky and plastic; common black coatings on ped faces; 15 percent coarse fragments; strongly acid.

Solum thickness ranges from 30 to 50 inches; depth to bedrock is more than 5 feet. Where the soil is unlimed, it is strongly acid to very strongly acid throughout. The content of coarse fragments ranges from 0 to 5 percent in the A and B horizons and up to 35 percent in the C horizon.

The Ap horizon ranges from brown (7.5YR 5/4) to dark yellowish brown (10YR 4/4).

The B horizon ranges from brown (7.5YR 4/4) through yellowish brown (10YR 5/6). Texture is silt loam, loam, clay loam, or sandy clay loam.

The C horizon ranges from brown (10YR 5/3) to strong brown (7.5YR 5/6). Texture is sandy clay loam, loam, or sandy loam.

Allenwood series

The Allenwood series consists of fine-loamy, mixed, mesic Typic Hapludults. The soils are deep and well drained. They have a gravelly silt loam Ap horizon and a reddish yellow gravelly silt loam Bt horizon. The Allenwood soils are at the base of ridges in the valleys of both counties. They formed in glacial material derived mainly from shale, siltstone, and sandstone. Slope ranges from 2 to 25 percent.

Allenwood soils are associated on the landscape with the well drained Edom, Berks, and Weikert soils; the moderately well drained Watson soils; and the somewhat poorly drained Alvira soils. Allenwood soils contain less clay in the solum than Edom soils and are deeper to bedrock than the Berks and Weikert soils.

Typical pedon of Allenwood gravelly silt loam, 2 to 8 percent slopes, in a semi-wooded area, in the southeast corner of Thompsontown.

Ap—0 to 8 inches; dark brown (10YR 4/3) gravelly silt loam; moderate medium granular structure; friable, nonsticky and nonplastic; many small tree roots; 15 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—8 to 13 inches; reddish brown (5YR 4/3) gravelly silt loam; weak fine granular structure; friable, slightly sticky and plastic; many small tree roots; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B21t—13 to 21 inches; reddish yellow (5YR 6/6) gravelly heavy silt loam; moderate medium subangular blocky structure; firm, sticky and plastic; few small tree roots; thin clay films on ped faces; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B22t—21 to 41 inches; reddish yellow (5YR 6/6) gravelly heavy silt loam; weak medium subangular blocky structure; firm, sticky and plastic; few small tree roots; thin clay films on ped faces; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

C—41 to 60 inches; red (2.5YR 4/6) gravelly silty clay loam; moderate medium subangular blocky structure; firm, sticky and plastic; few small tree roots; 30 percent coarse fragments; very strongly acid.

Solum thickness ranges from 40 to 75 inches. Bedrock is at a depth of more than 5 feet. Coarse fragments make up 5 to 20 percent of the A horizon, 5 to 40 percent of the Bt horizon, and 10 to 50 percent of the B3 and C horizons. Reaction is very strongly acid or extremely acid throughout when the soil is unlimed.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (7.5YR 5/4).

B1 horizon ranges from reddish brown (5YR 4/3) to strong brown (7.5YR 5/6). The B2 horizon ranges from reddish yellow (5YR 6/8) to red (2.5YR 4/6). The texture of the fine earth fraction of the B horizon ranges from heavy loam to silty clay loam.

The C horizon ranges from red (2.5YR 4/6) to strong brown (7.5YR 5/6) and from gravelly silty clay loam to gravelly clay loam.

Alvira series

The Alvira series consists of fine-loamy, mixed, mesic Aeric Fragiaquults. The soils are deep and somewhat poorly drained. They have a brown silt loam Ap horizon, a mottled strong brown heavy silt loam B2tg horizon, and a yellowish brown gravelly silt loam Bx horizon. Alvira soils are mainly in glaciated areas on uplands. The soils formed in glacial material derived from sandstone, siltstone, shale, and some quartzite. Slopes are smooth to slightly concave and depressional, and they range from 2 to 8 percent.

Alvira soils are associated on the landscape with deep, well drained Allenwood soils and moderately well drained Watson soils.

Typical pedon of Alvira silt loam, 2 to 8 percent slopes, in a cultivated field 2 1/2 miles east of Mifflintown along U. S. Highway 22, southeast of cemetery, on south side of road.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; many small grass roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B1—10 to 15 inches; yellowish brown (10YR 5/6) heavy silt loam; few fine distinct brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few small grass roots; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

B2tg—15 to 25 inches; strong brown (7.5YR 5/6) heavy silt loam; many medium prominent light gray (N 7/0) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin discontinuous clay films on ped faces; 5 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx1—25 to 48 inches; yellowish brown (10YR 5/6) gravelly silt loam; many medium distinct light gray (N 7/0) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, slightly sticky and slightly plastic; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—48 to 60 inches; yellowish brown (10YR 5/4) gravelly silt loam; many medium distinct light gray (N 7/0) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to the fragipan ranges from 16 to 28 inches, and depth to bedrock is more than 3 1/2 feet. The content of coarse fragments ranges from 5 to 30 percent above the fragipan and from 5 to 50 percent in the fragipan. Reaction ranges from strongly acid to extremely acid where the soil is unlimed.

The Ap horizon ranges from brown (7.5YR 4/4) to very dark grayish brown (2.5Y 3/2).

The B horizon ranges from brown (10YR 4/3) or strong brown (7.5YR 5/6) to light brownish gray (2.5Y 6/2). Textures of the fine earth are silt loam or silty clay loam.

The Bx horizon ranges from grayish brown (10YR 5/2) to yellowish red (5YR 5/6) with mottles of light gray (N 7/0) and strong brown (7.5YR 5/6). Fine earth textures range from silt loam to silty clay loam.

Andover series

The Andover series consists of fine-loamy, mixed, mesic Typic Fragiaquults. The soils are deep and poorly drained. They have a gravelly loam Ap horizon and a firm, gravelly clay loam Bx horizon. The Andover soils are on uplands, they are on benches and concave foot slopes and in swales, mainly along the bases of prominent ridges. They formed in colluvium derived from sandstone, conglomerate, quartzite, and shale. Slope ranges from 0 to 25 percent.

Andover soils are associated on the landscape with moderately deep, well drained Dekalb soils; deep, well drained Hazleton soils; deep, well drained Laidig soils; and deep, moderately well drained Buchanan soils. All the associated soils are on uplands.

Typical pedon of Andover gravelly loam, 2 to 8 percent slopes, on west side of Brown Township Road T-459, about 1 mile west of Barrville.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loam; weak fine granular structure; friable, nonsticky and nonplastic; many small grass roots; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.

B2tg—6 to 18 inches; light brownish gray (10YR 6/2) gravelly loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, slightly sticky and slightly plastic; common small grass roots; common clay films on ped faces; 30 percent coarse fragments; strongly acid; gradual smooth boundary.

Bx1g—18 to 32 inches; yellowish brown (10YR 5/4) gravelly clay loam; many medium distinct gray (10YR 6/1) mottles; weak, very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, sticky and plastic; common clay films on ped faces; 35 percent coarse fragments; strongly acid; gradual smooth boundary.

Bx2g—32 to 50 inches; yellowish brown (10YR 5/4) gravelly clay loam; many medium distinct gray (10YR 6/1) mottles; weak, very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, sticky and plastic; common clay films on ped faces; 40 percent coarse fragments; strongly acid; gradual smooth boundary.

C—50 to 60 inches; brown (10YR 5/3) very gravelly sandy clay loam; common medium distinct gray (10YR 6/1) mottles; massive; firm, sticky and plastic; 50 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 55 inches. Depth to the fragipan ranges from 16 to 28 inches. Coarse fragments 1 to 20 inches in diameter are well distributed, ranging from 10 to 40 percent, by volume, in individual layers of the B horizon and from 10 to 50 percent in the C horizon. Reaction is strongly acid or very strongly acid if the soil is not limed.

The A horizon ranges from black (10YR 2/1) to brown (10YR 4/3).

The upper part of the B horizon ranges from dark gray (10YR 4/1) to light brownish gray (2.5Y 6/2) mottled with strong brown (7.5YR 5/6).

Prism interiors in the Bx horizon range from yellowish brown (10YR 5/4) to brown (10YR 5/3) and are mottled. The B and C horizons range from loam to sandy clay loam or their gravelly analogs.

The C horizon ranges from brown (10YR 4/3) to gray (10YR 6/1).

Ashton series

The Ashton series consists of fine-silty, mixed, mesic Mollic Hapludalfs. The soils are deep and well drained. They have a silt loam Ap horizon and a brown and dark brown silt loam B horizon. The Ashton soils are on low stream terraces. They formed in alluvium derived from siltstone and shale. Slope ranges from 0 to 4 percent.

Ashton soils are associated on the landscape with the well drained Allegheny soils; the well drained Chavies soils; and the moderately well drained Monongahela soils. Ashton soils have more silt and less sand than Allegheny and Chavies soils.

Typical pedon of Ashton silt loam in a cultivated field 1 1/2 miles east of Lewistown Square between South Main Street and the Juniata River, 600 feet from the river.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; many grass roots; neutral; abrupt smooth boundary.

B1—9 to 14 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure: friable; few grass roots; slightly acid; gradual wavy boundary.

B21t—14 to 18 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; few grass roots; few thin clay films on ped faces; neutral; gradual wavy boundary.

B22t—18 to 43 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; few thin clay films on ped faces; slightly acid; gradual wavy boundary.

C—43 to 60 inches; brown (7.5YR 4/4) fine sandy loam; massive; very friable; medium acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 4 feet. Coarse fragments of rounded sandstone range from 0 to 5 percent, by volume, in the solum. Reaction ranges from neutral to medium acid throughout.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark brown (10YR 3/3).

The B horizon ranges from dark brown (10YR 4/3) to brown (7.5YR 4/4). Texture is silt loam or silty clay loam.

The C horizon ranges from brown (7.5YR 4/4) to dark yellowish brown (10YR 4/4), and texture is fine sandy loam, loam, and silt loam.

Atkins series

The Atkins series consists of fine-loamy, mixed, mesic Typic Fluvaquents. The soils are poorly drained. They have a silt loam Ap horizon and a gray silty clay loam B horizon. The Atkins soils are on flood plains. They formed in alluvium derived from shale, siltstone, and sandstone. Slope ranges from 0 to 3 percent.

Atkins soils are associated on the landscape with the deep, well drained Pope soils and moderately well drained Philo soils.

Typical pedon of Atkins silt loam in an old pasture along Arvardem Run about 2 1/2 miles downstream from U. S. Highway 22 in Atkinson Mills, about 150 feet south of the road.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; many grass roots; slightly acid; abrupt smooth boundary.

B1g—8 to 18 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; strongly acid; clear wavy boundary.

B2g—18 to 40 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; strongly acid; clear wavy boundary.

Cg—40 to 66 inches; gray (10YR 5/1) silt loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable, sticky and plastic; strongly acid.

Solum thickness ranges from 30 to 50 inches. Depth to bedrock is more than 4 feet. Coarse fragments range in volume from 0 to 20 percent throughout the profile. Reaction ranges from strongly acid to very strongly acid where the soil is unlimed.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2).

The B horizon ranges from light brownish gray (10YR 6/2) to gray (10YR 5/1) and has mottles of brown (7.5YR 5/4) to strong brown (7.5YR 5/8). Texture is silt loam or silty clay loam.

The C horizon is gray (10YR 5/1 or N 5/0) and has texture of silt loam, silty clay loam, and loam.

Berks series

The Berks series consists of loamy-skeletal mixed, mesic Typic Dystrochrepts. The soils are moderately deep and well drained. They have a shaly silt loam Ap horizon and a shaly silt loam and very shaly silt loam B horizon. Berks soils are on uplands. They formed in materials weathered from gray acid shale and siltstone. Slope ranges from 2 to 45 percent.

Berks soils are associated on the landscape with the shallow, well drained, Weikert soils; the deep, moderately well drained Ernest soils; and the deep, poorly drained Brinkerton soils.

Typical pedon of Berks shaly silt loam, 2 to 8 percent slopes, in a cultivated field 1/2 mile north of intersection of Pennsylvania Highway 235 and Legislative Route 34022 near Maze, in Juniata County.

Ap—0 to 5 inches; dark brown (10YR 4/3) shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 30 percent shale fragments; medium acid; abrupt smooth boundary.

B21—5 to 17 inches; yellowish brown (10YR 5/8) shaly silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; 35 percent shale fragments; strongly acid; gradual wavy boundary.

B22—17 to 27 inches; strong brown (7.5YR 5/6) very shaly silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; 70 percent shale fragments; strongly acid; clear irregular boundary.

C—27 to 32 inches; strong brown (7.5YR 5/6) very shaly silt loam; massive; friable, slightly sticky and slightly plastic; 75 percent shale fragments; medium acid; clear irregular boundary.

R—32 inches; olive (5Y 4/3) fractured shale; few silt and clay films in fractures.

Solum thickness ranges from 18 to 36 inches. Bedrock is at a depth of 20 to 40 inches. Fragments of shale or thin, flat siltstone or fine grained sandstone make up 10 to 50 percent of the Ap horizon, 25 to 75 percent of individual parts of the B horizon, and 60 to 80 percent of the C horizon. Reaction, where the soil is unlimed, is very strongly acid to strongly acid in the solum and is medium acid to very strongly acid in the C horizon.

The B horizon ranges from yellowish brown (10YR 5/8) to strong brown (7.5YR 5/6). Texture is shaly silt loam or shaly loam or their very shaly, channery, or very channery analogs.

The C horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/8) and has textures of very shaly silt loam and very shaly loam.

Brinkerton series

The Brinkerton series consists of fine-silty, mixed, mesic Typic Fragiaqualfs. The soils are deep and poorly drained. They have a silt loam Ap horizon and a grayish brown and light brownish gray silty clay loam B horizon. The Brinkerton soils are in depressions at the base of foot slopes in the uplands. They formed in colluvium derived from gray or brown acid shale, siltstone, and sandstone. Slope ranges from 0 to 8 percent.

Brinkerton soils are associated on the landscape with the well drained Berks soils and the moderately well drained Ernest soils.

Typical pedon of Brinkerton silt loam, 3 to 8 percent slopes, 1/2 mile east of U.S. Highway 22 on the Atkinson Mill's Road 44001.

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; many small grass roots; neutral; gradual smooth boundary.

B21tg—7 to 11 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin clay films on ped faces; 2 percent coarse fragments; medium acid; clear wavy boundary.

B22tg—11 to 16 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin discontinuous clay films on ped faces; 2 percent coarse fragments; medium acid; gradual wavy boundary.

Bxg—16 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thick platy; firm, brittle, slightly sticky and plastic; few patchy clay films on ped faces; 2 percent coarse fragments; medium acid; gradual wavy boundary.

C—45 to 65 inches; gray (10YR 6/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky and plastic; 1 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 50 inches. Depth to the fragipan ranges from 15 to 30 inches. Bedrock is below a depth of 6 feet. Coarse fragments of shale and sandstone range from 0 to 10 percent above the fragipan and from 2 to 20 percent in the fragipan. Reaction ranges from very strongly acid to medium acid in the solum, unless the soil is limed.

The A horizon ranges from dark grayish brown (10YR 4/2 or 2.5Y 4/2) to brown (10YR 5/3).

The Bt horizon ranges from light brownish gray (10YR 6/2) to grayish brown (2.5Y 5/2) mottled with strong brown (7.5YR 5/6). Texture of the B horizon ranges from silt loam to silty clay loam.

The Bx horizon ranges from light brownish gray (10YR 6/2) to gray (N 6/0) mottled with strong brown (7.5YR 5/6). Texture ranges from loam to silty clay loam.

Buchanan series

The Buchanan series consists of fine-loamy, mixed, mesic Aquic Fragiudults. The soils are deep and moderately well drained to somewhat poorly drained. They have a gravelly loam Ap horizon, a gravelly silt loam Bt horizon, and a firm gravelly loam Bx horizon. The Buchanan soils are on the sides and the foot slopes of the highest ridges in the uplands. They formed in colluvial material derived from sandstone mixed with a little siltstone and shale. Slope ranges from 3 to 15 percent.

Typical pedon of Buchanan gravelly loam, 8 to 15 percent slopes, in an old pasture on the east side of Licking Creek, 2 miles northeast of Clearview Reservoir, Juniata County, Milford Township.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam; weak medium granular structure; friable; 15 percent coarse fragments up to 3 inches in diameter; very strongly acid; abrupt smooth boundary.

A2—5 to 10 inches; yellowish brown (10YR 5/4) gravelly loam; moderate medium granular structure; friable; 15 percent coarse fragments up to 3 inches in diameter; very strongly acid; gradual clear boundary.

B1—10 to 15 inches; yellowish brown (10YR 5/4) gravelly silt loam; moderate medium subangular blocky structure; friable; few thin discontinuous clay films on ped faces; 15 percent coarse fragments up to 3 inches in diameter; very strongly acid; gradual wavy boundary.

B2t—15 to 21 inches; strong brown (7.5YR 5/6) gravelly silt loam; common medium distinct very pale brown (10YR 7/4) mottles; weak medium subangular blocky structure; firm; common thin clay films on ped faces; 15 percent coarse fragments up to 3 inches in diameter and occasional stones up to 15 inches in diameter; very strongly acid; gradual wavy boundary.

Bx1—21 to 29 inches; strong brown (7.5YR 5/6) gravelly loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to weak, medium, platy; firm, brittle; few thin clay films on ped faces; 15 percent coarse fragments up to 3 inches in diameter and occasional stones up to 15 inches in diameter; very strongly acid; gradual wavy boundary.

Bx2—29 to 60 inches; strong brown (7.5YR 5/6) gravelly loam; many coarse prominent light gray (10YR 7/2) mottles; weak very coarse prismatic structure parting to thick platy; firm, brittle; few thin clay films on ped faces; 15 percent coarse fragments up to 3 inches in diameter and occasional stones up to 15 inches; very strongly acid.

Solum thickness ranges from 40 to 60 inches. Bedrock is below a depth of 5 feet. Depth to the fragipan ranges from 20 to 36 inches. Coarse fragments range from 5 to 40 percent in individual horizons in the solum and from 10 to 40 percent in the C horizon. Reaction ranges from extremely acid to strongly acid where the soil is unlimed.

The A1 horizon ranges from very dark gray (10YR 3/1) to light brown (7.5YR 6/4). The Ap horizon ranges from very dark grayish brown (10YR 3/2) to light brown (7.5YR 6/4). The A2 horizon ranges from yellowish brown (10YR 5/4) to light brownish gray (10YR 6/2).

The B horizon ranges from pale brown (10YR 6/3) to strong brown (7.5YR 5/6) and has faint or distinct gray (10YR 6/1) to reddish yellow (5YR 6/6) mottles. Texture ranges from gravelly silt loam to gravelly clay loam.

The Bx horizon is mottled brownish yellow (10YR 6/6) to reddish brown (5YR 4/3). Texture ranges from gravelly loam to gravelly sandy clay loam.

Chavies series

The Chavies series consists of coarse-loamy, siliceous, mesic Typic Hapludalfs. The soils are deep and well drained. They have a dark brown loam Ap horizon and a reddish brown fine sandy loam B horizon. Chavies soils are on stream terraces. They formed in material derived from acid sandstone, siltstone, and shale and deposited by stream action. Slope ranges from 2 to 8 percent.

Chavies soils are associated on the landscape with the well drained Allegheny soils and the moderately well drained Monongahela soils on the higher terraces. Chavies soils have more sand and less clay than Allegheny soils and differ from Pope and Philo soils by having clay accumulation in the subsoil.

Typical pedon of Chavies loam, 2 to 8 percent slopes, along the Juniata River on road T-380 leading from Mexico to Port Royal, on the north side of the road near the Mexico camp area.

Ap—0 to 10 inches; dark brown (7.5YR 4/2) loam; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

B1—10 to 16 inches; reddish brown (5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; few small grass roots; neutral; gradual smooth boundary.

B21t—16 to 23 inches; reddish brown (5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; few clay films on ped faces; few small grass roots; medium acid; gradual smooth boundary.

B22t—23 to 40 inches; reddish brown (5YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; common thin clay films on ped faces; few small roots; medium acid; gradual smooth boundary.

C—40 to 76 inches; strong brown (7.5YR 5/6) gravelly fine sandy loam; massive; friable; 40 percent coarse fragments; medium acid.

Solum thickness ranges from 30 to 48 inches. Depth to coarse sand and gravel is more than 40 inches. Reaction is strongly acid or medium acid throughout the profile if the soil is not limed.

The Ap horizon ranges from dark brown (7.5YR 4/2) through dark yellowish brown (10YR 4/4).

The B horizon ranges in hue from 10YR through 5YR and has value of 4 or 5 and chroma of 4 to 6. Texture is loam or fine sandy loam.

The C horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6). Texture is fine sandy loam, loam, light silt loam, or the gravelly analogs of these textures.

Dekalb series

The Dekalb series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. The soils are moderately deep and well drained. They have a channery sandy loam A horizon and a very channery sandy loam B2 horizon. Dekalb soils are commonly on uplands on the sides of the high mountain ridges. They formed in material weathered from sandstone, conglomerate, and interbedded sandstone and shale. Slope ranges from 3 to 60 percent.

Dekalb soils are associated on the landscape with the deep, well drained Hazleton, Leetonia, and Laidig soils and with the moderately well drained Buchanan soils on the uplands. Dekalb soils were mapped only in a complex with Hazleton soils. Dekalb soils are less deep to bedrock than Hazleton, Leetonia, and Laidig soils.

Typical pedon of Dekalb very channery sandy loam, in a wooded area of Hazleton-Dekalb extremely stony sandy loams, gently sloping, on Pine Ridge in Juniata County, 1 1/2 miles north of Blacklog on the Blacklog-Licking Creek Road.

O1—Discontinuous trace of forest litter.

O2—Discontinuous trace of decomposed forest litter.

A1—0 to 1 inch; black (N 2/0) channery sandy loam; weak fine granular structure; very friable; 50 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—1 to 4 inches; gray (10YR 6/1) channery sandy loam; weak very fine granular structure; very friable; 50 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—4 to 9 inches; brownish yellow (10YR 6/6) channery sandy loam; weak fine subangular blocky structure; very friable; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.

B2—9 to 21 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak fine subangular blocky structure; very friable; 50 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—21 to 25 inches; strong brown (7.5YR 5/6) very channery sandy loam; massive; friable; 60 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—25 inches; fractured acid gray sandstone.

Solum thickness and depth to bedrock range from 20 to 40 inches. Sandstone fragments, 1 to 10 inches in diameter, are common throughout the profile making up 15 to 60 percent of the solum and more than 50 percent of the C horizon. Reaction is very strongly acid throughout the profile if the soil is unlimed.

The A1 horizon ranges from dark gray (N 4/0) to black (N 2/0). The A2 horizon ranges from light yellowish brown (10YR 6/4) to gray (10YR 6/1).

The B horizon ranges from yellowish brown (10YR 5/6) to reddish yellow (7.5YR 6/6). Texture of the B horizon ranges from channery loam to very channery sandy loam.

The C horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/4). Texture is very channery or flaggy sandy loam and loamy sand.

Edom series

The Edom series consists of fine, illitic, mesic Typic Hapludalfs. The soils are deep and well drained. They have a dark brown silty clay loam Ap horizon and a reddish brown and yellowish brown silty clay and clay B horizon. The Edom soils are on dissected uplands. They formed in material weathered from interbedded shaly limestone and calcareous shale. Slope ranges from 3 to 25 percent.

Edom soils are associated on the landscape with the shallow Opequon, Weikert, and Klinesville soils and with the deep, well drained Hagerstown soils. Edom soils have a thinner solum than Hagerstown soils.

Typical pedon of Edom silty clay loam, 8 to 15 percent slopes, in a cultivated field 0.6 mile east of Mifflintown on the Cedar Spring Road.

Ap—0 to 8 inches; dark brown (10YR 4/3) silty clay loam; moderate medium granular structure; friable, sticky and plastic; 5 percent shale fragments; neutral; abrupt smooth boundary.

B21t—8 to 17 inches; reddish brown (5YR 4/4) silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; many thin clay films on faces of peds; 5 percent shale fragments; neutral; clear wavy boundary.

B22t—17 to 27 inches; reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure; firm, sticky and plastic; many thin clay films on faces of peds; few thin black coatings on fragments; 10 percent shale fragments; medium acid; gradual wavy boundary.

B3—27 to 36 inches; yellowish brown (10YR 5/4) silty clay; weak medium platy structure; firm, sticky and plastic; common thin reddish brown (5YR 5/4) clay films in pores; few thin black coatings on fragments; 10 percent shale fragments; medium acid; clear wavy boundary.

C—36 to 46 inches; reddish brown (5YR 4/4) very shaly silty clay filling interstices between shale fragments; weak medium platy structure; firm, sticky and plastic; many thin clay films on fragments; few thin black coatings on fragments; 70 percent shale fragments; neutral; abrupt irregular boundary.

R—46 to 51 inches; interbedded shale and limestone; beds are nearly vertical.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 40 to 72 inches or more. Coarse fragments of calcareous shale or impure or shaly limestone make up 1 to 30 percent of the solum and 20 to 90 percent of the C horizon. Reaction ranges from neutral to medium acid throughout the profile. Some pedons have free carbonates in the B and C horizons.

The Ap horizon ranges from olive brown (2.5Y 4/4) to dark brown (7.5YR 3/2).

The B horizon ranges from reddish brown (5YR 4/3) to yellowish brown (10YR 5/6) and has silty clay or clay texture.

The C horizon ranges from reddish brown (5YR 4/4) to brown (7.5YR 5/4). Texture is shaly or very shaly silty clay loam, silty clay, or clay.

Elliber series

The Elliber series consists of loamy-skeletal, mixed, mesic Typic Hapludults. The soils are deep and well drained. They have a very cherty loam A horizon and a very cherty silt loam Bt horizon. The Elliber soils are on ridgetops and sides of ridges in the uplands. They formed in cherty material weathered from impure cherty limestone. Slope ranges from 3 to 60 percent.

Elliber soils are in close association on the landscape with the deep, well drained Mertz soils and moderately well drained Kreamer soils of the uplands. Elliber soils contain more than 50 percent fragments, whereas, Mertz soils have less than 50 percent.

Typical pedon of Elliber very cherty loam, 8 to 15 percent slopes, 3 miles west of Lewistown on Route 44308, 2.6 miles west of intersection with 44013, 0.5 mile northeast of farmstead and 20 feet south of corner of woods.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) very cherty loam; moderate very fine subangular blocky structure; very friable, nonsticky and slightly plastic; 55 percent chert fragments less than 3 inches in diameter; neutral; abrupt smooth boundary.

A2—8 to 15 inches; pale brown (10YR 6/3) very cherty loam; weak fine granular structure; friable, nonsticky and slightly plastic; 75 percent chert fragments, mostly less than 3 inches in diameter; medium acid; clear wavy boundary.

B1—15 to 25 inches; light yellowish brown (10YR 6/4) very cherty loam; weak medium subangular blocky structure; friable, nonsticky and slightly plastic; common silt films; 75 percent chert fragments, mostly less than 3 inches in diameter; very strongly acid; clear wavy boundary.

B21t—25 to 33 inches; reddish yellow (7.5YR 6/6) very cherty silt loam; weak medium and fine subangular blocky structure; firm, nonsticky and slightly plastic; common silt films; 60 percent chert fragments; very strongly acid; diffuse wavy boundary.

B22t—33 to 40 inches; reddish yellow (7.5YR 6/6) very cherty silt loam; weak medium and fine subangular blocky structure; firm, nonsticky and slightly plastic; many pores lined with clay films; thin black coatings on a few chert fragments; 65 percent chert fragments; very strongly acid; clear wavy boundary.

B31t—40 to 51 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak medium subangular blocky structure; firm, nonsticky and slightly plastic; many patchy clay films on chert fragments; thin black coatings on most chert fragments; 65 percent chert fragments; very strongly acid; diffuse wavy boundary.

B32t—51 to 61 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak medium subangular blocky structure; firm, nonsticky and slightly plastic; many patchy clay films on chert fragments; thin black coatings on most chert fragments; 65 percent chert fragments; very strongly acid; diffuse wavy boundary.

C—61 to 71 inches; strong brown (7.5YR 5/6) very cherty silt loam; massive; firm; few patchy clay films on chert fragments; 70 percent chert fragments; very strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 5 feet. In unlimed areas, reaction is strongly acid or very strongly acid in all horizons.

The Ap horizon ranges from brown (10YR 5/3) to very dark grayish brown (10YR 3/2). The A2 horizon ranges from pale brown (10YR 6/3) to very pale brown (10YR 7/4).

The B horizon ranges from brown (7.5YR 5/4) to brownish yellow (10YR 6/8), and texture is very cherty silt loam and loam. The B horizon averages 50 to 80 percent coarse fragments throughout.

The C horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6). Texture is very cherty silt loam and very cherty loam.

Ernest series

The Ernest series consists of fine-loamy, mixed, mesic Aquic Fragiudults. The soils are deep and moderately well drained. They have a dark brown silt loam Ap horizon, a yellowish brown silty clay loam Bt horizon, and a firm yellowish brown silty clay loam Bx horizon. The Ernest soils are on foot slopes of shale ridges. They formed in colluvial materials weathered from acid gray shale, siltstone, and sandstone. Slope ranges from 2 to 15 percent.

Ernest soils are associated on the landscape with the poorly drained Brinkerton soils; the well drained, moderately deep Berks soils; and the shallow, well drained Weikert soils.

Typical pedon of Ernest silt loam, 8 to 15 percent slopes, in a cultivated field, 2 miles northwest of McAlisterville, Juniata County (cornfield and peach orchard), on west side of Township Road T-428.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many corn and grass roots; 5 percent coarse fragments; strongly acid; clear smooth boundary.

B1—10 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; common small roots; 10 percent coarse fragments; strongly acid; gradual smooth boundary.

B2t—16 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common clay films on peds; common small roots; 10 percent coarse fragments; strongly acid; gradual smooth boundary.

Bx—24 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent mottles of light gray (10YR 7/2); moderate very coarse prismatic structure parting to thick platy; firm, brittle, slightly sticky and slightly plastic; thin patchy clay films on peds; few small roots; 10 percent shale fragments; strongly acid; gradual smooth boundary.

C—40 to 60 inches; brown (10YR 5/3) silty clay loam; few common fine distinct mottles of gray (10YR 6/1) and yellowish brown (10YR 5/6); massive; firm, slightly sticky and slightly plastic; black concretions; 20 percent shale; strongly acid.

Solum thickness ranges from 36 to 60 inches. Depth to bedrock is more than 6 feet. Depth to the fragipan ranges from 20 to 30 inches. Coarse fragments range from 5 to 20 percent in the B horizon and commonly reach 30 percent in the fragipan and C horizon. The reaction is strongly acid or very strongly acid throughout unless the soil is limed.

The Ap horizon ranges from grayish brown (10YR 5/2) through dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4).

The B horizon above the Bx horizon ranges from brown (10YR 5/3) through brownish yellow (10YR 6/6).

The Bx horizon ranges from yellowish brown (10YR 5/6) to light olive brown (2.5Y 5/6) and is mottled with light gray (10YR 7/2) to grayish brown (2.5Y 5/2). The B horizon is silt loam and silty clay loam.

The C horizon ranges from brown (10YR 5/3) to strong brown (7.5YR 5/6). Texture is silty clay loam or silty clay.

Evendale series

The Evendale series consists of clayey, mixed, mesic Aeric Ochraquults. The soils are deep and somewhat poorly drained. They have a cherty silt loam Ap horizon and a clay and cherty clay B horizon. The Evendale soils are on lower slopes below cherty ridges. They formed in material weathered from chert. Slope ranges from 0 to 4 percent.

Evendale soils are associated on the landscape with the well drained Mertz and Elliber soils and the moderately well drained Kreamer soils.

Typical pedon of Evendale cherty silt loam in Fayette Township, Juniata County, 0.5 mile on Liberty Road from the intersection of Town Ridge Road, 150 feet west from telephone pole number 44.

Ap—0 to 7 inches; dark brown (10YR 3/3) cherty silt loam, light brownish gray (10YR 6/2) when dry; moderate medium granular structure; friable, slightly sticky and slightly plastic; 25 percent chert fragments; neutral; abrupt smooth boundary.

A2—7 to 11 inches; pale brown (10YR 6/3) silty clay loam; common medium faint light brownish gray (10YR 6/2) mottles; weak medium and coarse subangular blocky structure; firm, slightly sticky and plastic; 10 percent chert fragments; strongly acid; clear wavy boundary.

B21tg—11 to 18 inches; light brownish gray (10YR 6/2) clay; common medium distinct strong brown (7.5YR 5/8) and pale brown (10YR 6/3) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm, sticky and plastic; common thin clay films in pores; 10 percent chert fragments; strongly acid; clear wavy boundary.

B22tg—18 to 33 inches; brownish yellow (10YR 6/6) cherty clay; light brownish gray (10YR 6/2) ped coatings; many medium distinct strong brown (7.5YR 5/8) and pale brown (10YR 6/3) mottles; moderate coarse prismatic structure; firm, sticky and plastic; common thin clay films on ped faces and in pores; 30 percent chert fragments; strongly acid; abrupt wavy boundary.

B23tg—33 to 42 inches; light gray (N 7/0) cherty clay; many coarse distinct yellowish brown (10YR 5/6) mottles within prisms; moderate very coarse prismatic structure; firm, sticky and plastic; common thin clay films on ped faces and in pores; 30 percent chert and sandstone fragments; strongly acid; clear wavy boundary.

B24tg—42 to 49 inches; light gray (N 7/0) cherty clay; many coarse prominent red (2.5YR 4/6) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure; firm, sticky and plastic; common thin clay films on ped faces and in pores; 20 percent sandstone and chert fragments; strongly acid; clear wavy boundary.

B25tg—49 to 60 inches; light gray (N 7/0) cherty clay; many coarse faint gray (N 6/0) mottles within prisms; strong very coarse prismatic structure; firm, sticky and plastic; many thin clay films in pores and on ped faces; 25 percent chert and sandstone fragments; strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 5 feet. Coarse fragments range from 10 to 40 percent in the solum and from 20 to 70 percent in the C horizon. Reaction ranges from neutral in the upper part of the solum to strongly acid and from very strongly acid to strongly acid in the lower part.

The Ap horizon ranges from brown (7.5YR 5/2) to dark brown (10YR 3/3). The A2 horizon ranges from pale brown (10YR 6/3) to brown (7.5YR 5/2). Texture of the fine earth is silt loam or silty clay loam.

The Bt horizon ranges from brown (7.5YR 5/2) through brownish yellow (10YR 6/6) to light gray (N 7/0). Texture is usually silty clay loam, clay, or silty clay. Ped coatings are grayish throughout the Bt horizon.

Hagerstown series

The Hagerstown series consists of fine, mixed, mesic Typic Hapludalfs. The soils are deep and well drained. They have a silt loam Ap horizon and a silty clay loam and silty clay Bt horizon. The Hagerstown soils are on uplands. They formed in material weathered from limestone. Slope ranges from 0 to 25 percent.

Hagerstown soils are associated on the landscape with the shallow, well drained Opequon soils; the somewhat poorly drained Penlaw soils; and the poorly drained Thorndale soils.

Typical pedon of Hagerstown silt loam, 2 to 8 percent slopes, in a cultivated field 5 miles south of Reesville on the south side of Pennsylvania Highway 655.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B1—8 to 14 inches; strong brown (7.5YR 5/6) silt loam; moderate fine angular blocky structure; firm, sticky and slightly plastic; neutral; clear wavy boundary.

B21t—14 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine angular blocky structure; firm, sticky and plastic; thick continuous clay films on ped faces; neutral; gradual wavy boundary.

B22t—18 to 30 inches; yellowish red (5YR 4/6) silty clay; strong medium angular blocky structure; firm, sticky and plastic; thick continuous clay films on ped faces; neutral; diffuse wavy boundary.

B23t—30 to 40 inches; yellowish red (5YR 4/6) silty clay; strong medium angular blocky structure; firm, sticky and plastic; thick continuous clay films on ped faces; neutral; diffuse wavy boundary.

B24t—40 to 60 inches; yellowish red (5YR 5/6) silty clay loam; strong medium angular blocky structure; firm, sticky and plastic; thick continuous clay films on ped faces; neutral.

Solum thickness ranges from 40 to 72 inches. Depth to bedrock ranges from 3 1/2 to 7 feet or more. Reaction is neutral to medium acid, if the soil is unlimed.

The Ap horizon ranges from reddish brown (5YR 4/3) to dark yellowish brown (10YR 4/4), and texture is silt loam or silty clay loam.

The B1 horizon has hue of 5YR to 7.5YR, value of 4 or 5, and chroma of 4 through 8. The Bt horizon ranges from red (2.5YR 5/6) to reddish brown (5YR 4/4). Some subhorizons have hue of 7.5YR, value of 4 or 5, and chroma of 4 through 6. Texture ranges from silty clay loam to clay.

Hazleton series

The Hazleton series consists of loamy-skeletal, mixed, mesic Typic Dystrochrepts. The soils are deep and well drained. They have a channery loam A horizon and a channery loam, channery sandy loam, and very channery sandy loam B horizon. Hazleton soils are on the higher ridges throughout the uplands of the survey area, but they are most common along the sides of the high mountain ridges. They formed in material weathered from sandstone, conglomerate, and interbedded sandstone and shale. Slope ranges from 3 to 75 percent.

Hazleton soils are associated on the landscape with the moderately deep Dekalb soils; the deep Leetonia and Laidig soils; and the deep, moderately well drained Buchanan soils. All the associated soils are on the uplands. The Hazleton soils are less sandy than the Leetonia soils. They differ from Laidig soils because they lack the fragipan and have more coarse fragments than the Laidig soils.

Typical pedon of Hazleton channery loam in a wooded area of Hazleton-Dekalb association, steep, about 0.8 mile northeast of Licking Creek Road, 300 yards east of V-shape curve in T328.

O1—Discontinuous layer of undecomposed forest litter.

O2—Discontinuous layer of partially decomposed leaves and twigs.

A1—0 to 1 inch; black (N 2/0) channery loam; weak fine granular structure; very friable; 15 percent coarse fragments; strongly acid; abrupt smooth boundary.

A2—1 to 2 inches; dark gray (10YR 4/1) channery loam; weak medium granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; strongly acid; abrupt wavy boundary.

B21ir—2 to 4 inches; light reddish brown (5YR 6/3) channery loam; weak medium granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; strongly acid; abrupt wavy boundary.

B22—4 to 6 inches; dark brown (7.5YR 4/4) channery sandy loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

B23—6 to 18 inches; dark brown (7.5YR 4/4) very channery sandy loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; 50 percent coarse fragments; strongly acid; gradual wavy boundary.

B24—18 to 36 inches; dark brown (7.5YR 4/4) very channery sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 50 percent coarse fragments; strongly acid; gradual wavy boundary.

C—36 to 60 inches; strong brown (7.5YR 5/6) very channery coarse sandy loam; massive; friable, nonsticky and nonplastic; 60 percent coarse fragments; strongly acid.

Solum thickness ranges from 25 to 50 inches. Depth to bedrock is 40 to 72 inches or more. Sandstone fragments, 1 to 10 inches in diameter, are common throughout the profile making up 5 to 70 percent of individual horizons of the solum. Reaction is strongly acid or very strongly acid throughout where the soil is unlimed.

The A1 horizon ranges from black (N 2/0) to very dark grayish brown (10YR 3/2). The A2 horizon ranges from dark gray (10YR 4/1) to yellowish brown (10YR 5/4). The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark brown (10YR 4/3).

The B horizon ranges from reddish yellow (5YR 6/8) to dark brown (7.5YR 4/4). Some pedons have Bhir or Bir horizons with hue of 5YR, value of 3 to 6, and chroma of 2 or 3. Texture in the B horizon ranges from channery loam to very channery sandy loam.

The C horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/4). Texture in the C horizon ranges from very channery sandy loam to very channery loamy sand.

Klinesville series

The Klinesville series consists of loamy-skeletal, mixed, mesic Lithic Dystrochrepts. The soils are shallow and well drained. They have shaly silt loam A and B horizons and a very shaly silt loam C horizon. The Klinesville soils are on uplands. They are on secondary ridges and in small areas on the steep sides of prominent ridges. Klinesville soils formed in material derived from fractured reddish shale or interbedded reddish sandstone and shale. Slope ranges from 3 to 50 percent.

Klinesville soils occur in close association on the landscape with the moderately deep Edom and Berks soils and the shallow Weikert soils. Klinesville soils are redder in color than the Weikert soils.

Typical pedon of Klinesville shaly silt loam, 8 to 15 percent slopes, in forest, at the east end of Shady Lane Street, South Mills, Lewistown.

O1—Trace, mixed hardwood litter.

O2—Trace, partially decayed organic matter.

A11—0 to 1 inch; dark reddish brown (5YR 3/2) shaly silt loam; weak fine granular structure; very friable; many small and medium tree roots; 20 percent coarse fragments; strongly acid; clear smooth boundary.

A12—1 to 6 inches; weak red (10R 4/4) shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; many small tree roots; 30 percent coarse fragments; strongly acid; gradual wavy boundary.

B2—6 to 12 inches; weak red (10R 4/4) shaly silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; many small tree roots; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

C—12 to 19 inches; weak red (10R 4/4) very shaly silt loam; massive; firm, slightly sticky and slightly plastic; silt coatings on shale fragments; 80 percent coarse fragments; strongly acid; gradual wavy boundary.

R—19 inches; weak red (10R 4/4) fractured shale bedrock.

Solum thickness and depth to bedrock range from 10 to 20 inches. These soils are shaly or very shaly silt loam throughout. Coarse fragments are dominantly shale and make up 15 to 70 percent of individual horizons of the solum and 45 to 90 percent of the C horizon. Reaction throughout ranges from very strongly acid to medium acid where the soil is unlimed.

The A horizon ranges from dark reddish brown (5YR 2/2) through weak red (10R 4/4).

The B and C horizons range from dark reddish brown (5YR 3/3) to red (10R 4/6).

Kreamer series

The Kreamer series consists of clayey, illitic, mesic Aquic Hapludults. The soils are deep and moderately well drained. They have a cherty silt loam Ap horizon and a cherty silty clay loam to cherty clay B horizon. The Kreamer soils are on uplands. They are nearly level to sloping and are on the sides of chert ridges. The soils formed in cherty material weathered from impure cherty limestone. Slope ranges from 2 to 15 percent.

Kreamer soils are associated on the landscape with the deep, well drained Elliber and Mertz soils and the somewhat poorly drained Evendale soils.

Typical pedon of Kreamer cherty silt loam, 8 to 15 percent slopes, in a cultivated field in Juniata County, 1 mile southeast of McAlisterville, 2,500 feet southeast of intersection of Van Wert and McMeen Roads.

Ap—0 to 8 inches; dark brown (10YR 4/3) cherty silt loam; moderate very fine subangular blocky structure; friable, slightly sticky and plastic; 15 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 15 inches; yellowish brown (10YR 5/4) cherty silty clay loam; moderate medium subangular blocky structure; friable, sticky and plastic; few thin clay films in pores; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—15 to 20 inches; yellowish brown (10YR 5/4) cherty silty clay loam; common medium distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films on ped faces; 20 percent chert fragments; very strongly acid; abrupt wavy boundary.

B23t—20 to 28 inches; strong brown (7.5YR 5/6) cherty silty clay; many medium distinct brown (10YR 5/3) and light brownish gray (10YR 6/2) mottles; moderate medium blocky structure; firm, sticky and plastic; thin continuous clay films on ped faces; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

B24t—28 to 40 inches; dark yellowish brown (10YR 4/4) cherty silty clay; weak medium subangular blocky structure; firm, sticky and plastic; moderately thick continuous clay films on ped faces; many black coatings on ped faces; 30 percent coarse fragments; strongly acid; clear wavy boundary.

B25t—40 to 48 inches; yellowish brown (10YR 5/4) cherty clay; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak medium blocky structure; firm, sticky and plastic; thick continuous clay films on ped faces; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B26t—48 to 60 inches; strong brown (7.5YR 5/6) cherty silty clay; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; weak medium blocky structure; firm, sticky and plastic; thick patchy clay films on ped faces; 25 percent coarse fragments; strongly acid; clear wavy boundary.

C—60 to 67 inches; yellowish brown (10YR 5/6) cherty silty clay; few medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; massive; firm, sticky and plastic; thick clay films in pores; 30 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 5 feet. The content of coarse fragments, dominantly chert but with some sandstone and shale, ranges from less than 5 to 50 percent by volume in individual horizons. Reaction, where the soil is cultivated, ranges from neutral to very strongly acid in the upper part of the solum and is strongly acid or very strongly acid in the lower part.

The Ap horizon ranges from dark brown (7.5YR 4/2) to dark yellowish brown (10YR 4/4).

The Bt horizon ranges from strong brown (7.5YR 5/6) to dark yellowish brown (10YR 4/4) with mottles of pale brown, strong brown, light brownish gray, yellowish brown and brown. Texture of the fine earth ranges from silty clay loam to clay.

The C horizon ranges from yellowish brown (10YR 5/6) to brown (10YR 5/3) and has texture of cherty clay to cherty silty clay loam.

Laidig series

The Laidig series consists of fine loamy, mixed, mesic Typic Fragiudults. The soils are deep and well drained. They have a channery loam A horizon, a channery sandy clay loam B2 horizon, and a firm channery sandy clay loam Bx horizon. The Laidig soils are on uplands. They are on the lower slopes of sandstone ridges and the foot slopes of the mountains. They formed in material weathered from shale and sandstone. Slope ranges from 3 to 35 percent.

Laidig soils are associated on the landscape with the well drained, moderately deep Dekalb soils; the deep, moderately well drained and somewhat poorly drained Buchanan soils; the poorly drained Andover soils; and the deep, well drained Hazleton soils. Laidig soils have a fragipan; Hazleton soils do not. Laidig soils contain fewer coarse fragments than Hazleton soils.

Typical pedon of Laidig gravelly loam, in a wooded area of Laidig extremely stony loam, 8 to 25 percent slopes, along Forest State Road in Licking Creek Valley, 1/10 mile from Huntingdon and Mifflin County line, 100 feet north of road.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) channery loam; weak fine granular structure; friable; many fine tree roots; 20 percent coarse fragments; very strongly acid; abrupt clear boundary.

A2—2 to 5 inches; yellowish brown (10YR 5/4) channery loam; weak fine granular structure; friable; many fine tree roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B1—5 to 10 inches; yellowish brown (10YR 5/6) channery loam; weak fine subangular blocky structure; friable; few fine tree roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B2t—10 to 30 inches; strong brown (7.5YR 5/6) channery sandy clay loam; weak fine subangular blocky structure; firm, sticky and plastic; few medium tree roots; common thin clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx—30 to 65 inches; yellowish brown (10YR 5/4) channery sandy clay loam; few faint brown (10YR 5/3) mottles; weak very coarse prismatic structure parting to weak medium platy; firm, brittle, sticky and plastic; few fine tree roots between prisms; clay films and bridging between sand grains; few black concretions; 40 percent coarse fragments; very strongly acid.

Solum thickness ranges from 60 to 80 inches. Depth to bedrock is more than 6 feet. Depth to fragipan ranges from 30 to 50 inches. Reaction is strongly acid or very strongly acid. Content of coarse fragments ranges from 10 to 35 percent in the B1 and Bt horizons and from 30 to 70 percent in the Bx horizon.

The A1 and Ap horizons range from dark grayish brown (10YR 4/2) to brown (7.5YR 5/4). The A2 horizon ranges from gray (10YR 5/1) to reddish yellow (7.5YR 6/6).

The B1 and Bt horizons range from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6).

The Bx horizon ranges from yellowish brown (10YR 5/4) to strong brown (7.5YR 5/6) and is mottled. Texture of the fine earth fraction of the B horizon ranges from loam to sandy clay loam.

Leetonia series

The Leetonia series consists of sandy-skeletal, siliceous, mesic Entic Haplorthods. The soils are deep and well drained to excessively drained. They have a gravelly loamy sand A horizon and a very gravelly loamy sand and gravelly sand B horizon. The Leetonia soils are on ridges. They formed in material weathered from sandstone, conglomerate, and quartzite. Slope ranges from 0 to 12 percent.

Leetonia soils are associated on the landscape with the well drained, moderately deep Dekalb soils and the deep, well drained Hazleton soils. Leetonia soils contain more sand than the Hazleton soils.

Typical pedon of Leetonia gravelly loamy sand, from an area of Leetonia extremely stony loamy sand, 0 to 12 percent slopes, near Coopers Gap, along Barrville Road at intersection of Conklin Road leading to Lingle Valley, Mifflin County.

O1—4 to 2 inches; oak leaf litter.

O2—2 inches to 0; partly decomposed fibrous mat of organic matter.

A1—0 to 2 inches; dark gray (10YR 4/1) gravelly loamy sand; weak fine granular structure; very friable; many fine and medium tree roots; 35 percent coarse fragments; extremely acid; abrupt wavy boundary.

A2—2 to 6 inches; light brownish gray (10YR 6/2) gravelly loamy sand; weak coarse granular structure; very friable; few fine and medium roots; 40 percent coarse fragments; extremely acid; abrupt wavy boundary.

B21h—6 to 10 inches; dark brown (7.5YR 4/4) gravelly loamy sand; moderate coarse granular structure; very friable; few fine and medium roots; 35 percent coarse fragments; extremely acid; smooth wavy boundary.

B22h—10 to 17 inches; dark brown (7.5YR 4/4) gravelly loamy sand; moderate medium granular structure; very friable; many fine and medium roots; 35 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3—17 to 23 inches; brownish yellow (10YR 6/6) very gravelly sand; single grain; loose; few fine roots; 45 percent coarse fragments; very strongly acid; clear wavy boundary.

C—23 to 48 inches; olive yellow (2.5Y 6/6) very gravelly sand; single grain; loose; few roots; 50 percent coarse fragments; very strongly acid; diffuse irregular boundary.

R—48 inches; gray hard sandstone rock.

Solum thickness ranges from 18 to 32 inches. Depth to bedrock is 40 to 48 inches. Coarse fragments range from 35 to 65 percent in the profile. They are very strongly acid to extremely acid throughout.

The A1 horizon ranges from black (10YR 2/1) to dark gray (10YR 4/1). The A2 horizon ranges from light brownish gray (10YR 6/2) to grayish brown (10YR 5/2).

The Bh horizon ranges in hue from 10YR to 5YR, and has value of 3 or 4 and chroma of 3 to 6. The B3 horizon ranges in hue from 7.5YR to 10YR and has value of 5 or 6 and chroma of 4 through 6. Texture is gravelly or very gravelly loamy sand or sand.

The C horizon ranges from olive yellow (2.5Y 6/6) to yellowish brown (10YR 5/6) and has texture of very gravelly sand and loamy sand.

Melvin series

The Melvin series consists of fine-silty, mixed, nonacid, mesic Typic Fluvaquepts. The soils are deep and poorly drained. They have a brown silt loam Ap horizon and a gray silty clay loam B horizon. Melvin soils are on flood plains. They formed in nonacid alluvium derived from limestone, calcareous shale, siltstone, and sandstone. Slope ranges from 0 to 3 percent.

Melvin soils are associated on the landscape with the deep, well drained Nolin soils and the somewhat poorly drained Newark soils.

Typical pedon of Melvin silt loam, in Juniata County between U.S. Highways 11 and 15 and the Susquehanna River, 800 feet north of the Perry County line.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable, slightly sticky and plastic; many small grass roots; neutral; abrupt smooth boundary.

B21g—9 to 15 inches; gray (10YR 6/1) silty clay loam; common fine distinct yellowish red (5YR 5/8) mottles; weak fine subangular blocky structure; firm, sticky and plastic; few small grass roots; slightly acid; gradual wavy boundary.

B22g—15 to 24 inches; gray (10YR 6/1) silty clay loam; common fine distinct yellowish red (5YR 5/8) mottles; weak fine subangular blocky structure; firm, sticky and plastic; slightly acid; gradual wavy boundary.

B3g—24 to 40 inches; light gray (N 7/0) silty clay loam; common fine distinct reddish brown (5YR 4/4) mottles; weak fine subangular blocky structure; firm, sticky and plastic; slightly acid; gradual wavy boundary.

C—40 to 60 inches; light gray (N 7/0) gravelly silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; moderate medium granular structure; friable, sticky and plastic; 15 percent coarse fragments; slightly acid.

Solum thickness ranges from 18 to 40 inches. Depth to bedrock is more than 6 feet. Content of coarse fragments is 0 to 5 percent to a depth of 30 inches, and below this depth individual horizons range from 0 to 20 percent. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

The Ap horizon ranges from brown (10YR 4/3) through light gray (5Y 7/1) and has a loam or silt loam texture.

The B horizon ranges from light gray (10YR 7/2 or N 7/0) to dark gray (5Y 4/1). Texture is silt loam or silty clay loam.

The C horizon ranges from dark gray (N 4/0) through light gray (10YR 7/2). Texture is gravelly silt loam or light silty clay loam.

Mertz series

The Mertz series consists of loamy-skeletal, mixed, mesic Typic Hapludults. The soils are deep and well drained. They have a cherty silt loam A horizon and a heavy cherty silt loam to very cherty clay loam B horizon. The Mertz soils are on uplands. They formed in material weathered from cherty sandstone and limestone. Slope ranges from 3 to 25 percent.

Mertz soils are associated on the landscape with the well drained Elliber soils, the moderately well drained Kreamer soils, and the somewhat poorly drained Evendale soils. Mertz soils contain fewer coarse fragments than the Elliber soils.

Typical pedon of Mertz cherty silt loam, 3 to 8 percent slope, in a cultivated field in Monroe Township, Juniata County, 200 feet south of a point on Pennsylvania Highway 35, 1 1/2 miles west of Richfield, and 200 yards east of a church.

Ap—0 to 9 inches; dark brown (10YR 3/3) cherty silt loam, very pale brown (10YR 7/3) when dry; moderate medium granular structure; friable, slightly sticky and slightly plastic; 30 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—9 to 16 inches; brown (7.5YR 4/4) cherty silty clay loam; weak medium subangular blocky structure; friable, sticky and plastic; common thin clay films in pores; 35 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—16 to 26 inches; strong brown (7.5YR 5/6) heavy cherty silt loam; weak fine subangular blocky structure; firm, sticky and plastic; common thin clay films on peds and many in pores; 35 percent coarse fragments; slightly acid; gradual wavy boundary.

IIB23t—26 to 35 inches; strong brown (7.5YR 5/6) very cherty heavy loam; few coarse faint yellowish red (5YR 5/8) mottles; weak medium and fine subangular blocky structure; firm, sticky and plastic; many moderately thick clay films in pores and common on ped faces; few black coatings on peds and fragments; 50 percent coarse fragments; medium acid; clear wavy boundary.

IIB24t—35 to 47 inches; strong brown (7.5YR 5/6) very cherty clay loam; few coarse faint yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; firm, sticky and plastic; common thin clay films on peds; moderately thick in pores; common black coatings on peds and on fragments; 60 percent coarse fragments; strongly acid; clear wavy boundary.

IIB25t—47 to 63 inches; strong brown (7.5YR 5/6) very cherty clay loam; few coarse faint yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; firm, slightly sticky and plastic; many clay films in pores and on fragments; common black coatings on fragments; 70 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 6 feet. Reaction ranges from slightly acid to strongly acid in the upper part of the solum and is strongly acid or very strongly acid in the lower part of the solum and in the C horizon. Coarse fragment content ranges from 15 to 50 percent in the upper part of the solum and from 15 to 80 percent in the lower part.

The Ap horizon ranges from very dark grayish brown (10YR 3/2) to brown (7.5YR 5/4).

The B horizon ranges from reddish brown (5YR 4/4) to brownish yellow (10YR 6/8). Texture of the fine earth part of the B horizon is clay loam, silty clay loam, heavy loam, or heavy silt loam.

Millheim series

The Millheim series consists of fine, illitic, mesic Typic Hapludalfs. The soils are deep and well drained. They have a silt loam Ap horizon and a shaly silty clay Bt horizon. The Millheim soils are on sides of ridges in the uplands. They formed in material weathered from carbonaceous shale. Slope ranges from 3 to 15 percent.

Millheim soils are associated on the landscape with the moderately deep, well drained Berks soils; the deep, well drained Hagerstown soils; and the shallow, well drained Opequon soils. Millheim soils have fewer coarse fragments in the solum than the Berks soils, and Millheim soils have an argillic horizon. Millheim soils are less red in the Bt horizon than the Hagerstown soils.

Typical pedon of Millheim silt loam, 8 to 15 percent slopes, in an abandoned field, on north side of Back Mountain Road 44005 3 miles southwest of Woodland, in Big Valley.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

B1—6 to 10 inches; brown (7.5YR 5/4) silty clay loam; weak medium blocky structure; firm, slightly sticky and slightly plastic; thin patchy clay films in pores; slightly acid; clear smooth boundary.

B2t—10 to 20 inches; yellowish brown (10YR 5/4) shaly silty clay; strong coarse blocky structure; firm, sticky and plastic; moderately thick clay films on ped faces; 15 percent coarse fragments; medium acid; gradual smooth boundary.

B3—20 to 36 inches; dark brown (10YR 4/3) shaly silty clay; moderate coarse prismatic structure; friable, sticky and plastic; thick clay films on ped faces and in pores; 30 percent coarse fragments; slightly acid; gradual smooth boundary.

C—36 to 42 inches; very dark grayish brown (10YR 3/2) very shaly silty clay; weak medium angular blocky structure; friable, slightly sticky and slightly plastic; thin patchy clay films; 75 percent coarse fragments; slightly acid; abrupt smooth boundary.

R—42 inches, very dark gray carbonaceous shale.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 3 1/2 to 5 feet. Content of coarse fragments ranges from 0 to 20 percent in the upper part of the solum and from 15 to 35 percent in the lower part. In areas that are not limed, reaction is very strongly acid to medium acid in the upper part of the solum and medium acid to neutral in the lower part of the solum and in the C horizon.

The Ap horizon ranges from brown (10YR 4/3) through dark brown (7.5YR 3/2).

The B horizon ranges from brown (7.5YR 5/4) to very dark grayish brown (10YR 3/2), and the fine earth part of the B horizon is silty clay loam or silty clay.

The C horizon is shaly or very shaly silty clay or clay loam.

Monongahela series

The Monongahela series consists of fine-loamy, mixed, mesic Typic Fragiudults. The soils are deep and moderately well drained. They have silt loam Ap and Bt horizons and a firm, loam Bx horizon. The Monongahela soils are on stream terraces. They formed in alluvium derived from sandstone, siltstone, and shale. Slope ranges from 0 to 8 percent.

Monongahela soils are associated on the landscape with the deep, well drained Allegheny and Chavies soils; the somewhat poorly drained Tyler soils; and the poorly drained Purdy soils.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in a cultivated field 300 yards south of Kosher Poultry Plant on State Road 34047 in Mifflintown, Juniata County.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B1—10 to 16 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; neutral; clear wavy boundary.

B2t—16 to 28 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; medium acid; clear wavy boundary.

Bx1—28 to 43 inches; light yellowish brown (10YR 6/4) loam; common fine distinct light brownish gray (2.5Y 6/2) mottles; weak very coarse prismatic structure parting to weak thick platy; firm, brittle, slightly sticky and slightly plastic; thin discontinuous clay films on peds; very strongly acid; clear irregular boundary.

Bx2—43 to 56 inches; light yellowish brown (10YR 6/4) loam; many distinct yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; weak very coarse prismatic structure parting to thick platy; firm, brittle; discontinuous clay films; very strongly acid; clear wavy boundary.

C—56 to 70 inches; strong brown (7.5YR 5/6) clay loam; common medium distinct light gray (10YR 7/2) mottles; massive; firm; 10 percent coarse fragments; very strongly acid.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 6 feet. Depth to the fragipan ranges from 18 to 30 inches. Coarse fragments range from 0 to 10 percent above the fragipan, 0 to 20 percent in the fragipan, and 10 to 40 percent in the C horizon. Reaction is strongly acid to very strongly acid throughout unless the soil is limed.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 4/3).

The B horizon ranges from strong brown (7.5YR 5/6) to light yellowish brown (10YR 6/4). Texture ranges from silt loam to loam and clay loam.

The C horizon ranges from brown (7.5YR 5/2) to yellow (2.5Y 7/6).

Morrison series

The Morrison series consists of fine-loamy, mixed, mesic Ultic Hapludalfs. The soils are deep and well drained. They have a gravelly sandy loam A horizon and a gravelly heavy sandy loam Bt horizon. The Morrison soils are on plateaus of secondary ridges in valleys of the uplands. They formed in material weathered from weakly calcareous sandstone and siltstone. Slope ranges from 3 to 25 percent.

Morrison soils are associated on the landscape with the deep, well drained Hagerstown soils and the moderately deep, well drained Berks soils. Morrison soils contain more sand and less clay than the Hagerstown soils.

Typical pedon of Morrison gravelly sandy loam, 3 to 8 percent slopes, in a wooded area 1 mile southeast of Flint Hill School, Route 34023, Walker Township, Juniata County.

O1—Discontinuous layer of hardwood leaves.

O2—Discontinuous layer of decayed organic matter.

A1—0 to 1 inch; black (10YR 2/1) gravelly sandy loam; weak fine granular structure; friable, nonsticky and nonplastic; many medium tree roots; 20 percent coarse fragments; neutral; clear smooth boundary.

A2—1 to 9 inches; pale brown (10YR 6/3) gravelly sandy loam; weak fine granular structure; friable, slightly sticky and nonplastic; many medium tree roots; 20 percent coarse fragments; neutral; gradual wavy boundary.

B21—9 to 16 inches; yellowish brown (10YR 5/6) gravelly sandy loam; moderate medium subangular blocky structure; firm, slightly sticky and slightly plastic; common medium tree roots; 20 percent coarse fragments; slightly acid; gradual wavy boundary.

B22t—16 to 38 inches; strong brown (7.5YR 5/6) gravelly heavy sandy loam; moderate medium subangular blocky structure; firm, sticky and plastic; few small tree roots; common thin clay films on ped faces; 20 percent coarse fragments; medium acid; gradual wavy boundary.

B3—38 to 50 inches; yellowish red (5YR 5/6) gravelly heavy sandy loam; moderate medium subangular blocky structure; firm, sticky and plastic; 30 percent coarse fragments; medium acid; gradual wavy boundary.

C—50 to 72 inches; yellowish red (5YR 5/6) gravelly heavy sandy loam; massive; firm, sticky and plastic; 30 percent coarse fragments; medium acid.

Solum thickness ranges from 40 to 70 inches. Depth to sandstone bedrock is 6 feet or more. Content of coarse fragments ranges from 2 to 20 percent, by volume, in the A horizon and upper part of the B horizon and normally increases to 30 to 40 percent in the lower part of the B horizon and C horizon. Reaction, where the soil is unlimed, ranges from

extremely acid to strongly acid in the upper part of the solum and from strongly acid to medium acid in the lower part of the solum and in the C horizon.

The A horizon ranges from black (10YR 2/1) to pale brown (10YR 6/3) and is gravelly sandy loam in texture.

The B horizon ranges from yellowish brown (10YR 5/6 to 5/8) and strong brown (7.5YR 5/6) to reddish yellow (5YR 6/8). Texture is gravelly sandy loam to gravelly sandy clay loam.

The C horizon ranges from yellowish red (5YR 4/6) to yellowish brown (10YR 5/8). Texture is gravelly heavy sandy loam.

Murrill series

The Murrill series consists of fine-loamy, mixed, mesic Typic Hapludults. The soils are deep and well drained. They have a gravelly loam Ap horizon and a gravelly silty clay loam and gravelly sandy clay loam Bt horizon. The Murrill soils are on uplands. They formed in material weathered from sandstone and shale colluvium over limestone. Slope ranges from 3 to 15 percent.

Murrill soils are associated on the landscape with the deep, well drained Hagerstown soils; the moderately well drained Buchanan soils; and the somewhat poorly drained Penlaw soils. Murrill soils have less clay in the solum than the Hagerstown soils.

Typical pedon of Murrill gravelly loam, 8 to 15 percent slopes, in a cultivated field along Back Mountain Road, 1/2 mile north of Stone Mountain Village, 3 miles south of Barrville.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak fine granular structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—8 to 14 inches; brown (7.5YR 4/4) gravelly loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; slightly acid; clear wavy boundary.

B21t—14 to 20 inches; yellowish brown (10YR 5/4) gravelly silty clay loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; few black coatings; few thin clay films on ped faces; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—20 to 31 inches; dark brown (7.5YR 4/4) gravelly silty clay loam; moderate coarse subangular blocky structure; firm, slightly sticky and slightly plastic; many thin clay films on ped faces; 30 percent coarse fragments; strongly acid; gradual wavy boundary.

B23t—31 to 60 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; weak medium subangular blocky structure; firm, slightly sticky and plastic; few patchy black coatings on ped faces; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

IIB3—60 to 80 inches; reddish brown (5YR 4/4) sandy clay loam; strong medium coarse angular blocky structure; firm, sticky and plastic; black coatings on ped faces; strongly acid.

Solum thickness is 6 feet or more. Depth to limestone bedrock is more than 6 feet. Coarse fragments range from 10 to 30 percent in the upper part of the solum. If lithologic discontinuities occur in the profile, they are void of coarse fragments. Reaction ranges from strongly acid to very strongly acid throughout if the soil is not limed.

The Ap horizon ranges from dark yellowish brown (10YR 4/4) to very dark grayish brown (10YR 3/2).

The B horizon ranges from reddish brown (5YR 4/4) to brownish yellow (10YR 6/6). Texture of the fine earth fraction is loam, silt loam, silty clay loam, or sandy clay loam.

The C horizon ranges from reddish brown (5YR 4/4) to strong brown (7.5YR 5/6).

Newark series

The Newark series consists of fine-silty, mixed, nonacid, mesic Aeric Fluventic Haplaquepts. The soils are deep and are poorly drained and somewhat poorly drained. They have a dark brown silt loam Ap horizon and a mottled yellowish brown and gray silt loam and heavy silt loam B horizon. The Newark soils are on flood plains and in upland drainageways. They formed in alluvium weathered from limestone. Slope ranges from 0 to 3 percent.

Newark soils are associated on the landscape with the deep, well drained Nolin and Pope soils and the moderately well drained Philo soils.

Typical pedon of Newark silt loam in a cultivated field along Highway 972 and 3/4 mile south of Siglerville.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; firm, slightly sticky and slightly plastic; many fine grass roots; mildly alkaline; abrupt smooth boundary.

B21—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; many fine faint light brownish gray (10YR 6/2) mottles; moderate medium granular structure; firm, slightly sticky and slightly plastic; few fine grass roots; mildly alkaline; gradual wavy boundary.

B22g—13 to 21 inches; gray (10YR 6/1) heavy silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; strong coarse subangular blocky structure; firm, sticky and plastic; few fine grass roots; mildly alkaline; gradual wavy boundary.

C1—21 to 50 inches; gray (10YR 6/1) silt loam; many medium prominent strong brown (7.5YR 5/6) mottles; moderate coarse granular structure; firm, sticky and plastic; mildly alkaline; gradual wavy boundary.

IIC2—50 to 60 inches; brown (10YR 4/3) gravelly sandy loam; single grain; loose; 30 percent loam fragments; neutral.

Solum thickness ranges from 20 to 40 inches. Reaction ranges from medium acid to mildly alkaline throughout the profile. Depth to bedrock is more than 6 feet. The content of coarse fragments ranges from 0 to 5 percent to a depth of 30 inches; from 0 to 15 percent between 30 and 50 inches; and from 0 to 35 percent below 50 inches. Depth to contrasting material is 40 inches or more.

The Ap horizon ranges from brown (7.5YR 4/4) to dark grayish brown (10YR 4/2).

The B horizon ranges from yellowish brown (10YR 5/4) to dark grayish brown (2.5Y 4/2) with mottles of brown (10YR 5/3) through gray (10YR 6/1). Texture is silt loam or light silty clay loam. The Bg horizon ranges from light gray (10YR 7/1) through dark grayish brown (2.5Y 4/2) and the mottles are in shades of brown. Texture ranges from heavy silt loam to silty clay loam.

The C horizon ranges from brown (10YR 5/3) to gray (N 5/0 or 10YR 6/1). Texture is silt loam or loam to a depth of 40 inches or more. Gravelly sandy loam is at a depth of 40 inches or more.

Nolin series

The Nolin series consists of fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts. The soils are deep and well drained. They have a dark brown silt loam Ap horizon and a dark yellowish brown and brown silt loam B horizon. The Nolin soils are along streams. They formed in local alluvium weathered from limestone. Slope ranges from 0 to 3 percent.

Nolin soils are associated on the landscape with the well drained Hagerstown soils and the somewhat poorly drained Penlaw soils. Nolin soils have less clay and are not so red as the Hagerstown soils.

Typical pedon of Nolin silt loam, in a cultivated field, 300 feet northeast of the Vocational Technical School's greenhouse, Lewistown, Mifflin County.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; many medium roots; neutral; clear wavy boundary.

B21—10 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic, many small grass roots; slightly acid; gradual smooth boundary.

B22—26 to 60 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; few black concretions; slightly acid.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 4 1/2 to 6 feet. Reaction is neutral to slightly acid throughout.

The Ap horizon ranges from dark brown (10YR 4/3) to brown (10YR 5/3).

The B horizon ranges from yellowish brown (10YR 5/4) to dark brown (10YR 4/3), and the texture is silt loam or light silty clay loam.

Opequon series

The Opequon series consists of clayey, mixed, mesic Lithic Hapludalfs. The soils are shallow and well drained. They have a silty clay loam Ap horizon and a yellowish red silty clay and red clay B2 horizon. The Opequon soils are on uplands. They formed in materials weathered from limestone. Slope ranges from 3 to 35 percent.

Opequon soils are associated on the landscape with the deep, well drained Hagerstown and Edom soils and with the somewhat poorly drained Penlaw soils.

Typical pedon of Opequon silty clay loam, 3 to 8 percent slopes, in a field 300 yards north of the Juniata-Mifflin Vocational Technical school at Lewistown, Mifflin County.

Ap—0 to 8 inches; dark brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; firm, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B21t—8 to 12 inches; yellowish red (5YR 4/6) silty clay; strong medium angular blocky structure; firm, slightly sticky and plastic; 10 percent coarse fragments; common clay films on ped faces; slightly acid; gradual smooth boundary.

B22t—12 to 16 inches; red (2.5YR 4/6) clay; strong medium angular blocky structure; firm, sticky and plastic; 12 percent limestone fragments; common distinct clay films on ped faces; slightly acid; abrupt irregular boundary.

R—16 inches; shaly impure limestone coated with soil material.

Solum thickness and depth to bedrock range from 12 to 20 inches. The solum ranges from slightly acid to neutral. Coarse fragments make up 0 to 15 percent of the A horizon and 5 to 30 percent of the B horizon.

The Ap horizon ranges from brown (10YR 5/3) to dark brown (7.5YR 4/4).

The B horizon ranges from strong brown (7.5YR 5/6) to red (2.5YR 4/8). Texture ranges from heavy silty clay loam to clay.

Penlaw series

The Penlaw series consists of fine-silty, mixed, mesic Aquic Fragiudalfs. The soils are deep and somewhat poorly drained. They have a silt loam Ap horizon, a silty clay loam Bt horizon, and a firm silty clay loam Bx horizon. The Penlaw soils are on uplands. They formed in colluvium weathered mainly from limestone. Slope ranges from 0 to 3 percent.

Penlaw soils are associated on the landscape with the well drained Hagerstown, Edom, Millheim, and Nolin soils.

Typical pedon of Penlaw silt loam, in a cultivated field, 1/4 mile south of Allensville, on the west side of Pennsylvania Highway 655.

Ap—0 to 11 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable, sticky and plastic; many small grass and alfalfa roots; slightly acid; abrupt clear boundary.

B21t—11 to 19 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few medium alfalfa roots; thin clay films on ped faces; slightly acid; gradual wavy boundary.

B22t—19 to 30 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct light gray (N 7/0) mottles; moderate coarse subangular blocky structure; firm, sticky and plastic; thin clay films on ped faces; medium acid; gradual wavy boundary.

Bx—30 to 45 inches; yellowish brown (10YR 5/4) light silty clay loam; common medium distinct gray (N 6/0) mottles; weak very coarse prismatic structure parting to moderate coarse subangular blocky; firm, brittle, sticky and plastic; thin clay films on ped faces; neutral; gradual wavy boundary.

C—45 to 69 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct brownish yellow (10YR 6/8) mottles; massive; firm, sticky and plastic; neutral.

Solum thickness ranges from 40 to 60 inches. Depth to the fragipan ranges from 15 to 30 inches. Depth to bedrock ranges from 40 to 72 inches or more.

The content of coarse fragments of chert, weathered limestone, shale, or, rarely, sandstone, range from 0 to 10 percent above the fragipan and from 0 to 30 percent in the fragipan and C horizon. Reaction ranges from medium acid to neutral throughout the soil.

The Ap horizon ranges from dark brown (10YR 4/3) to grayish brown (2.5Y 5/2).

The Bt horizon ranges from light brownish gray (10YR 6/2) to brown (7.5YR 5/4).

Texture ranges from silt loam to silty clay loam. The Bx horizon ranges from brown (7.5YR 5/4) to brownish yellow (10YR 6/8). Texture is silt loam or light silty clay loam.

The C horizon ranges from yellowish brown (10YR 5/4) to dark reddish brown (5YR 3/4), and texture is silty clay.

Philo series

The Philo series consists of coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. The soils are deep and moderately well drained. They have a dark brown silt loam Ap horizon and a dark yellowish brown and brown silt loam B horizon. The Philo soils are on flood plains. They formed in alluvium derived mainly from sandstone and shale. Slope ranges from 0 to 3 percent.

Philo soils are associated on the landscape with the deep, well drained Pope soils and the poorly drained Atkins soils.

Typical pedon of Philo silt loam, in a cleared area in Tuscarora Campground, 1/4 mile north of Pennsylvania Highway 75, 2 1/2 miles south of East Waterford.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many roots; strongly acid; abrupt smooth boundary.

B1—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine granular structure; friable; strongly acid; gradual smooth boundary.

B2—14 to 22 inches; brown (10YR 5/3) silt loam; few fine distinct dark brown (7.5YR 3/2), brown (7.5YR 4/4), and gray (10YR 5/1) mottles; weak fine subangular blocky structure; firm; strongly acid; clear smooth boundary.

C1—22 to 32 inches; gray (10YR 5/1) silt loam; common distinct strong brown (7.5YR 5/8) mottles; massive; friable; common black concretions; strongly acid; clear smooth boundary.

C2—32 to 42 inches; gray (10YR 5/1) loam; common distinct strong brown (7.5YR 5/8) mottles; massive; firm; strongly acid; clear smooth boundary.

IIC3—42 to 60 inches, stratified sand and gravel.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 3 1/2 to 12 feet. Texture of the A and B horizons ranges from silt loam to loam. The reaction throughout all horizons ranges from medium acid to very strongly acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) through brown (10 YR 4/3).

The B horizon ranges from brown (7.5YR 4/4) through yellowish brown (10YR 5/6).

The C horizon ranges from light yellowish brown (10YR 6/4) through dark gray (10YR 4/1) and dark grayish brown (10YR 4/2). Texture is silt loam and loam.

Pope series

The Pope series consists of coarse-loamy, mixed, mesic Fluventic Dystrochrepts. The soils are deep and well drained. They have a dark brown fine sandy loam Ap horizon and a brown and dark yellowish brown fine sandy loam B2 horizon. The Pope soils are on flood plains along the major streams. They formed in alluvium weathered from acid sandstone and shale. Slope ranges from 0 to 3 percent.

Pope soils are associated on the landscape with the well drained Allegheny soils; the moderately well drained Monongahela and Philo soils; and the poorly drained Atkins soils. Pope soils are on flood plains, and Allegheny soils are on stream terraces.

Typical pedon of Pope fine sandy loam, in a cultivated area of Pope soils, 2 miles south of East Waterford, along Pennsylvania Highway 75, 300 feet west of this point.

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; moderate medium granular structure; friable; 3 percent coarse fragments; many fine roots; neutral; clear smooth boundary.

B21—8 to 27 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; 3 percent coarse fragments; common fine roots; very strongly acid; clear wavy boundary.

B22—27 to 45 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; very friable; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—45 to 85 inches; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; massive; friable; 15 percent coarse fragments; very strongly acid.

Solum thickness ranges from 30 to 50 inches. Depth to bedrock is more than 6 feet. The solum contains 0 to 15 percent coarse fragments and the C horizon 10 to 30 percent. Reaction is strongly acid or very strongly acid if the soil is not limed.

The Ap horizon ranges from grayish brown (10YR 5/2) through dark yellowish brown (10YR 4/4). Texture of the A horizon is fine sandy loam, loam, or silt loam.

The B horizon ranges from brown (10YR 4/3) to reddish yellow (7.5YR 6/6), and texture is sandy loam, fine or very fine sandy loam, loam, or silt loam.

The C horizon ranges from dark yellowish brown (10YR 4/4) to reddish yellow (7.5YR 6/6) and is gravelly fine sandy loam in texture.

Purdy series

The Purdy series consists of clayey, mixed, mesic Typic Ochraquults. The soils are deep and poorly drained to very poorly drained. They have a dark grayish brown silt loam Ap horizon and a mottled dark gray silty clay Bt horizon. The Purdy soils are on stream terraces. They formed in material weathered from sandstone, siltstone, and shale. Slope ranges from 0 to 3 percent.

Purdy soils are associated on the landscape with the moderately deep, well drained Berks soils and the shallow, well drained Weikert soils on uplands; the deep, moderately well drained Monongahela soils on terraces; and the deep, somewhat poorly drained Tyler soils on terraces.

Typical pedon of Purdy silt loam, in a cultivated field, 3 1/4 miles along T-355, southeast of the intersection with County Road 44012 to a point 300 yards due east along T-374.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; very strongly acid; gradual smooth boundary.

B1g—9 to 19 inches; gray (10YR 5/1) silty clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm, extremely acid; gradual smooth boundary.

B2tg—19 to 40 inches; dark gray (10YR 4/1) silty clay; many coarse prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure; firm, sticky and plastic; thin continuous clay films; few roots; very strongly acid; gradual smooth boundary.

Cg—40 to 60 inches; gray (5Y 6/1) silty clay; massive; firm, sticky and plastic; very strongly acid.

Solum thickness ranges from 28 to 50 inches. Depth to bedrock is more than 4 feet. Reaction ranges from strongly acid to extremely acid throughout.

The Ap horizon ranges from gray (10YR 5/1) through dark grayish brown (10YR 4/2).

The B horizon ranges from gray (10YR 5/1) to dark grayish brown (10YR 4/2). Texture of the B horizon is silty clay, clay loam, clay, or silty clay loam.

The C horizon ranges from gray (5Y 6/1) to dark brown (10YR 4/3). Texture is generally silty clay, but the range includes clay loam or clay.

Tyler series

The Tyler series consists of silty, mixed, mesic Aeric Fragiaquulfs. The soils are deep and somewhat poorly drained. They have a silt loam Ap horizon, a heavy silt loam Bt horizon, and a firm silt loam Bx horizon. The Tyler soils are on terraces or high bottoms. They formed in alluvium derived from weathered shale, siltstone, and sandstone. Slope ranges from 0 to 3 percent.

Tyler soils are associated on the landscape with the deep, well drained Allegheny soils; the moderately well drained Monongahela soils; and the poorly drained Purdy soils.

Typical pedon of Tyler silt loam, in a cultivated field, on the west side of Black Top Road, 1/2 mile north of the village of Mount Pleasant, Juniata County.

Ap—0 to 9 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; friable, sticky and plastic; few small grass roots; neutral; abrupt smooth boundary.

B1—9 to 15 inches; yellowish brown (10YR 5/6) silt loam; few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; strongly acid; gradual wavy boundary.

B2tg—15 to 21 inches; light brownish gray (10YR 6/2) heavy silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin clay films on ped faces; strongly acid; gradual wavy boundary.

Bx—21 to 46 inches; light gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, sticky and plastic; strongly acid; gradual wavy boundary.

Cg—46 to 60 inches; gray (N 6/0) loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, sticky and plastic; strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to the fragipan is 15 to 24 inches, and the depth to bedrock is more than 5 feet. The solum is nearly free of coarse fragments. If the soil is not limed, reaction throughout the solum ranges from strongly acid to extremely acid.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3).

The B horizon ranges from light brownish gray (10YR 6/2) to yellowish brown (10YR 5/6). Texture is silt loam or silty clay loam. The Bx horizon has hue of 10YR to 5Y, value of 5 or 6, and dominant chroma of more than 2. Texture is silt loam or silty clay loam.

The C horizon ranges from gray (N 6/0) to light yellowish brown (2.5Y 6/4); its texture is silty clay loam.

Vanderlip series

The Vanderlip series consists of mesic, coated Typic Quartzipsamments. The soils are deep and well drained and have loamy sand texture throughout the profile. The Vanderlip soils are on ridgetops and side slopes in the uplands. They formed in material weathered from slightly calcareous sandstone. Slope ranges from 5 to 15 percent.

Vanderlip soils are associated on the landscape with the deep, well drained Hagerstown, Elliber, and Morrison soils and the moderately deep Dekalb soils. The Vanderlip soils contain more sand in the profile than all of those soils.

Typical pedon of Vanderlip loamy sand, 5 to 15 percent slopes, in a wooded area 2 miles northeast of Vira, on top of the ridge east of and parallel to Vira Road.

O1—3 to 2 inches; discontinuous leaf litter.

O2—2 inches to 0; decomposed leaf litter.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) loamy sand; weak fine granular structure; friable, nonsticky and nonplastic; very strongly acid; clear wavy boundary.

A2—3 to 20 inches; yellowish brown (10YR 5/6) loamy sand; massive; very friable, nonsticky and nonplastic; very strongly acid; gradual wavy boundary.

B—20 to 56 inches; light yellowish brown (10YR 6/4) loamy sand; single grain; loose; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—56 to 76 inches; yellowish brown (10YR 5/6) very gravelly loamy sand; single grain; loose; 55 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 70 inches. Depth to bedrock ranges from 4 to 8 feet. The content of coarse fragments ranges from 0 to 20 percent in the upper part of the solum, from 0 to 40 percent in the lower part of the solum, and from 0 to 70 percent in the C horizon. Reaction throughout the soil ranges from very strongly acid to medium acid.

The A1 horizon ranges from black (10YR 2/1) to dark grayish brown (10YR 4/2), and the A2 horizon ranges from brown (10YR 5/3) to brownish yellow (10YR 6/6). Texture of the A1 and A2 horizons is loamy sand or sand.

The B horizon ranges from light yellowish brown (10YR 6/4) to olive yellow (2.5Y 6/6), and texture of the fine earth fraction is loamy sand and sand.

The C horizon ranges from yellowish brown (10YR 5/6) to olive yellow (2.5Y 6/6), and texture of the fine earth fraction is loamy sand and sand.

Watson series

The Watson series consists of fine-loamy, mixed, mesic Typic Fragiudults. The soils are deep and moderately well drained. They have a gravelly silt loam Ap horizon, a gravelly heavy loam and gravelly silty clay loam Bt horizon, and a firm, gravelly heavy loam Bx horizon. The Watson soils are on foothills in the glaciated parts of the uplands. They formed in glacial material derived from gray and brown shale and sandstone. Slope ranges from 2 to 15 percent.

Watson soils are associated on the landscape with the deep, well drained Allenwood soils and the somewhat poorly drained Alvira soils.

Typical pedon of Watson gravelly silt loam, 2 to 8 percent slopes, in a pasture 1/8 mile north of Thompsontown, along Township Road T-460.

Ap—0 to 8 inches; dark brown (10YR 3/3) gravelly silt loam; weak fine granular structure; friable, slightly sticky and plastic; many small grass roots; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) gravelly silt loam; moderate fine granular structure; firm, slightly sticky and slightly plastic; few small grass roots; 15 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—13 to 18 inches; strong brown (7.5YR 5/6) gravelly heavy loam; moderate medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films on ped faces; 30 percent coarse fragments; medium acid; gradual wavy boundary.

B22t—18 to 28 inches; yellowish red (5YR 5/6) gravelly silty clay loam; common medium faint strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films on ped faces; 30 percent coarse fragments; medium acid; gradual wavy boundary.

Bx1—28 to 40 inches; yellowish red (5YR 4/6) gravelly heavy loam; many coarse prominent light gray (5YR 6/1) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, sticky and plastic; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—40 to 60 inches; yellowish red (5YR 4/6) gravelly heavy loam; many coarse prominent light gray (5YR 5/1) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle, sticky and plastic; 20 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 72 inches, and depth to bedrock is more than 5 feet. Depth to the fragipan ranges from 18 to 32 inches. Reaction is very strongly acid to strongly acid throughout the soil. The content of coarse fragments ranges from less than 5 to 20 percent in the A horizon, from 10 to 40 percent in individual parts of the Bt horizon and from 10 to 50 percent in the Bx and C horizons.

The Ap horizon ranges from dark reddish brown (5YR 3/2) through dark yellowish brown (10YR 4/4).

The B1 and Bt horizons range from reddish brown (5YR 5/4) through yellowish brown (10YR 5/8), and texture is gravelly silt loam to gravelly heavy loam and gravelly silty clay loam. The Bx horizon ranges from reddish brown (2.5YR 4/4) through reddish yellow (7.5YR 6/6), and tex-

ture is gravelly heavy loam, gravelly silt loam, or gravelly silty clay loam.

Weikert series

The Weikert series consists of loamy-skeletal, mixed, mesic Lithic Dystrochrepts. The soils are shallow and well drained. They have a shaly silt loam Ap horizon and a very shaly silt loam B horizon. The Weikert soils are on dissected ridges in the uplands. They formed in material weathered from acid gray shale, siltstone, and some sandstone. Slope ranges from 3 to 25 percent.

Weikert soils are associated on the landscape with the moderately deep, well drained Berks soils; the deep, well drained Edom soils; the deep, moderately well drained Ernest soils; and the deep, poorly drained Brinkerton soils.

Typical pedon of Weikert shaly silt loam, 3 to 8 percent slopes, in a cultivated field 300 yards southeast of the intersection of T-481 with the north boundary of Greenwood Township, Juniata County.

Ap—0 to 7 inches; dark brown (10YR 4/3) shaly silt loam; weak fine granular structure; friable; 35 percent coarse fragments; strongly acid; gradual wavy boundary.

B2—7 to 14 inches; yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; friable; 50 percent coarse fragments; strongly acid; gradual wavy boundary.

C—14 to 18 inches; yellowish brown (10YR 5/4) very shaly silt loam; massive; friable; 70 percent coarse fragments; very strongly acid; clear wavy boundary.

R—18 inches; dark gray (10YR 4/1) acid shale bedrock.

Solum thickness ranges from 8 to 20 inches. Depth to bedrock ranges from 10 to 20 inches. Coarse fragments make up 20 to 50 percent of the A horizon, 30 to 65 percent of the B horizon, and 60 to 85 percent of the C horizon. If the soil is not limed, reaction is strongly acid to very strongly acid.

The Ap horizon ranges from dark brown (10YR 4/3) to very dark grayish brown (10YR 3/2).

The B horizon ranges from yellowish brown (10YR 5/6) to dark brown (10YR 4/3). Texture is shaly silt loam to very shaly silt loam or their channery analogs.

The C horizon ranges from dark brown (10YR 4/3) to yellowish brown (10YR 5/4). Texture is very shaly silt loam to very shaly loam.

Classification

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol.* An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu,* meaning water. plus *ent,* from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Fluvaquents (*Fluv,* meaning stream produced, plus *aquent,* the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, acid, mesic, Typic Fluvaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the soils

This section describes the formation and morphology of the soils in Juniata and Mifflin Counties. The first part explains the factors of soil formation, and the second part explains the processes of soil formation.

Factors of soil formation

Soils are complex mixtures of weathered rocks, minerals, organic matter, water, and air in varying proportions. They formed through the chemical and physical weathering of geologic materials. The extent of the weathering and the characteristics of any soil that develops depend on the nature of the parent rock; the kind of climate; the relief, or lay of the land; the plant and animal life in and on the soil; and the length of time these factors have affected development.

In a small area, such as Juniata and Mifflin Counties, where vegetation, time, and climate vary only slightly, the nature of the parent rock produces more differences in texture and mineral content than most of the other soil-forming factors. Climate influences the nature and extent of the weathering processes. Relief affects drainage, aeration, runoff, erosion, and exposure to sun and wind. Plant and animal life influence soil characteristics by both physical and chemical removals and additions. Finally, time is required for the other soil-forming factors to exert their influence. Long periods of time are necessary for changes in soils to become apparent. Nevertheless, soils are slowly but constantly changing.

Parent material

The soils of Juniata and Mifflin Counties formed mainly in material weathered from shale, siltstone, sandstone, and limestone. Limestone weathered to form the parent material of the Hagerstown and Opequon soils. Acid siltstone and shale weathered to form the parent material of the Weikert, Berks, and Klinesville soils.

Acid sandstone and conglomerate weathered to form the parent material of the Hazleton, Leetonia, and Dekalb soils. Because their parent material was coarse-grained sandstone, the Hazleton and Leetonia soils have a high content of sand. Elliber and Mertz soils formed in materials weathered from cherty limestone. The high content of rock fragments is inherited from the chert in the parent material.

Sediments deposited on terraces and flood plains of streams make up the parent material of the Allegheny, Philo, Atkins, Melvin, and Newark soils. The characteristics of these soils depend on the texture and other characteristics of the alluvial materials.

Climate

This survey area has the humid-temperate, continental type of climate characteristic of the Middle Atlantic States. Some characteristics of the soil profiles indicate that this kind of climate prevailed when the soils were forming and that it influenced soil development. Many of the soils are acid and strongly leached.

The effect of climate on the formation of soils has been nearly uniform throughout the survey area. The development of some soils, however, may have been influenced by a microclimate caused by differences in relief.

Topography

Topography depends to a large extent on the nature of the underlying rock. The highest ridges in the landscape, such as those occupied by the Hazleton and Leetonia soils, occur where the rocks are most resistant to weathering. Topography affects surface runoff, and runoff, in turn, affects the soils over which it flows. Water from runoff also enters streams that play a part in causing erosion and in dissecting areas of soils. Furthermore, in areas of sloping or hilly topography, runoff and gravity cause soil material to wash or move from the side slopes and to accumulate at the base of the slopes. Accumulated material at the base of slopes is an important part of the material in which the Laidig, Andover, and Buchanan soils formed.

Plant and animal life

Hardwood trees have apparently had more effect on the formation of the soils of Juniata and Mifflin Counties than other kinds of plants. Forests of hardwoods originally covered most of the county. The forests were mainly of the oak-hickory type, but forests of sugar maple, beech, and yellow birch occupied less extensive areas.

The soils are typical of those developed under forest. Where they have not been disturbed, a layer of leaf litter covers the surface and is underlain by a black O2 horizon 1 to 3 inches thick. The O2 horizon is commonly underlain by a dark-colored A1 horizon 1 to 2 inches thick. Beneath the A1 horizon is a light-colored A2 horizon several inches thick, similar to the one in the profile described as representative of the Leetonia series.

When the forests were cleared and the soils were farmed, the layers of organic matter were incorporated into the plow layer or were burned. Thus, in many places the soils were left open to wind and rain, which caused accelerated erosion.

Since the soils were first cleared, man has had a major effect on them through such practices as cultivation, liming, artificial drainage, manuring, and maintenance of perennial grasses and legumes. This effect will continue to be felt. The neutral reaction of the upper 8 inches of the profile described as representative of the Hagerstown series is a result of man's influence.

Time

The length of time the other factors of soil formation have operated is indicated, to some extent, by the degree of development of the soil profile. Some soils, especially those that formed in alluvium, show little profile development because the soil material has not been in place long enough for distinct horizons to form. Examples of soils that formed in alluvium are the Philo, Atkins, Melvin, and Pope soils. These soils show little horizon development because they continually have fresh material deposited on the surface. They are called young, or recent soils.

The profile development of the Weikert, Berks, and Hazleton soils shows that some changes have taken place in the parent material. These changes, however, do not represent the effects of advanced weathering. Weathering and the development of the profile of those soils have been slowed as a result of relief and the kind of parent material.

The Hagerstown, Laidig, Edom, and Morrison soils have well-developed profiles. The parent material has been in place long enough that distinct horizons have had time to develop.

Processes of soil formation

As weathering proceeds and plants grow on a young soil, several processes cause layers, or horizons, to develop in the soil. For example, leaves and plant remains accumulate on the surface. This accumulation is easily seen in areas of Dekalb and Hazleton soils and other soils that formed under forest and have not been plowed. Organic matter, chemicals, and mineral material are also brought in from adjacent areas by animals, floodwaters, and wind, or they are transferred as a result of gravity.

Losses from the soils occur when minerals decompose and part of the products of weathering are leached from the soils in solution. This process is apparent in the Edom and Hagerstown soils, from which calcium carbonate has been lost. Losses also occur when plant nutrients are removed in harvested plants. In addition, fine particles of soil material are removed by erosion, and gases escape as organic matter decomposes.

The transfer or translocation of material from one part of the soil to another is common in most soils. Organic matter is moved from the upper part of the profile to the lower part in suspension or solution. Calcium is leached from the surface layer and is held by the clay in the subsoil. The Allenwood and Laidig soils are examples of soils in which the results of this process can be seen. In those soils, clay has accumulated in the B horizon as a result of transfer of clay from horizons higher in the profile.

Bases and plant nutrients are moved upward when they are absorbed by the roots of plants and rise in the stem to be stored in the leaves and twigs. When the plant dies and decays, the plant nutrients are returned to the soil.

Transformations occur as chemical weathering takes place. During the process of chemical weathering, iron, aluminum, calcium, and other elements are released from the primary and secondary minerals in the soil. The gray and white colors of the parent material of a well-drained Hagerstown soil, for example, gradually are replaced by the red, brown, and yellow colors of oxidized iron compounds as the parent material weathers. These changed colors indicate that iron has been released or that ferrous oxide has been oxidized to ferric oxide in the presence of an adequate supply of oxygen.

Major soil horizons

The results of the soil-forming processes are reflected in the different horizons in a soil profile. The soil profile extends from the surface downward to materials that are little altered by the soil-forming processes.

Most soils contain three major mineral horizons designated: A, B, and C. In a further subdivision of these major horizons, numbers and letters are used to indicate important soil characteristics. An example is the B2t horizon, which designates a layer within the B horizon containing clay translocated from the A horizon. Most soils that have not been disturbed by cultivation contain a thin organic horizon on top of the mineral soil. This organic horizon is designated by the letter O.

The A horizon is the surface mineral layer. That part of the A horizon having the largest accumulation of organic matter is called the A1 horizon. The layer of maximum leaching, or eluviation, of clay and iron is called the A2 horizon. The A2 horizon of many soils in the survey area is brownish in color because of the oxidation of iron.

The B horizon is below the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the A horizon. In some soils the B horizon forms through alteration of material in place rather than by illuviation. This alteration may be the result of oxidation and reduction of iron or the weathering of minerals. The B horizon generally has blocky or prismatic structure. Generally, it is firmer and lighter colored than the A1 horizon and brighter colored than the C horizon.

Together the A and B horizons constitute the solum—the zone in which most of the mineral and organic matter has been added, removed, transferred, or translocated through the soil-forming processes.

The C horizon is below the A and B horizons in most soils. It consists of materials that were little altered by the soil-forming processes, though the materials may be modified by weathering.

Below the C horizon in some soils there is an R horizon, which is consolidated bedrock, such as limestone, shale, or sandstone. A few soils do not have a C horizon, and the R horizon is directly below the B horizon.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 1. Am Soc. Agron. Publ., 770 pp.

(3) Ciolkosz, E. J., G. W. Petersen, R. L. Cunningham, and R. P. Matelski. 1975. Soils developed from colluvium in the Ridge and Valley area of Pennsylvania. Proc. 1973 Int. Geobot. Conf. Univ of Tenn. press.

(4) Ciolkosz, E. J., G. W. Petersen, R. L. Cunningham, R. P. Matelski, and R. Pennock, Jr. 1974. Characteristics, interpretations and uses

of Pennsylvania soils developed from cherty limestone materials. Pa. State Agric. Exp. Stn. Prog. Rep. 341., 108 pp.

(5) Fenneman, N. M. 1938. Physiography of eastern United States. 714 pp., illus.

(6) Pennock, R. Jr., E. J. Ciolkosz, R. L. Cunningham, G. W. Petersen, and R. P. Matelski. 1974. Characteristics, interpretations and uses of Pennsylvania soils developed from colluvium. Pa. State Agric. Exp. Stn. Prog. Rep. 344, 49 pp.

(7) Society of American Foresters. 1954. Forest cover types of North America. Rep. Comm. Forest Types, 67 pp.

(8) United States Department of Agriculture. 1951. Soil survey manual. U. S. Dep. of Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(9) United States Department of Agriculture. 1968. The timber resources of Pennsylvania. Forest Serv. Resour. Bull. E-8.

(10) United States Department of Agriculture. 1975. Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	Less than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by running water, wind, ice, other geologic agents and by such processes as gravitation creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Illustrations

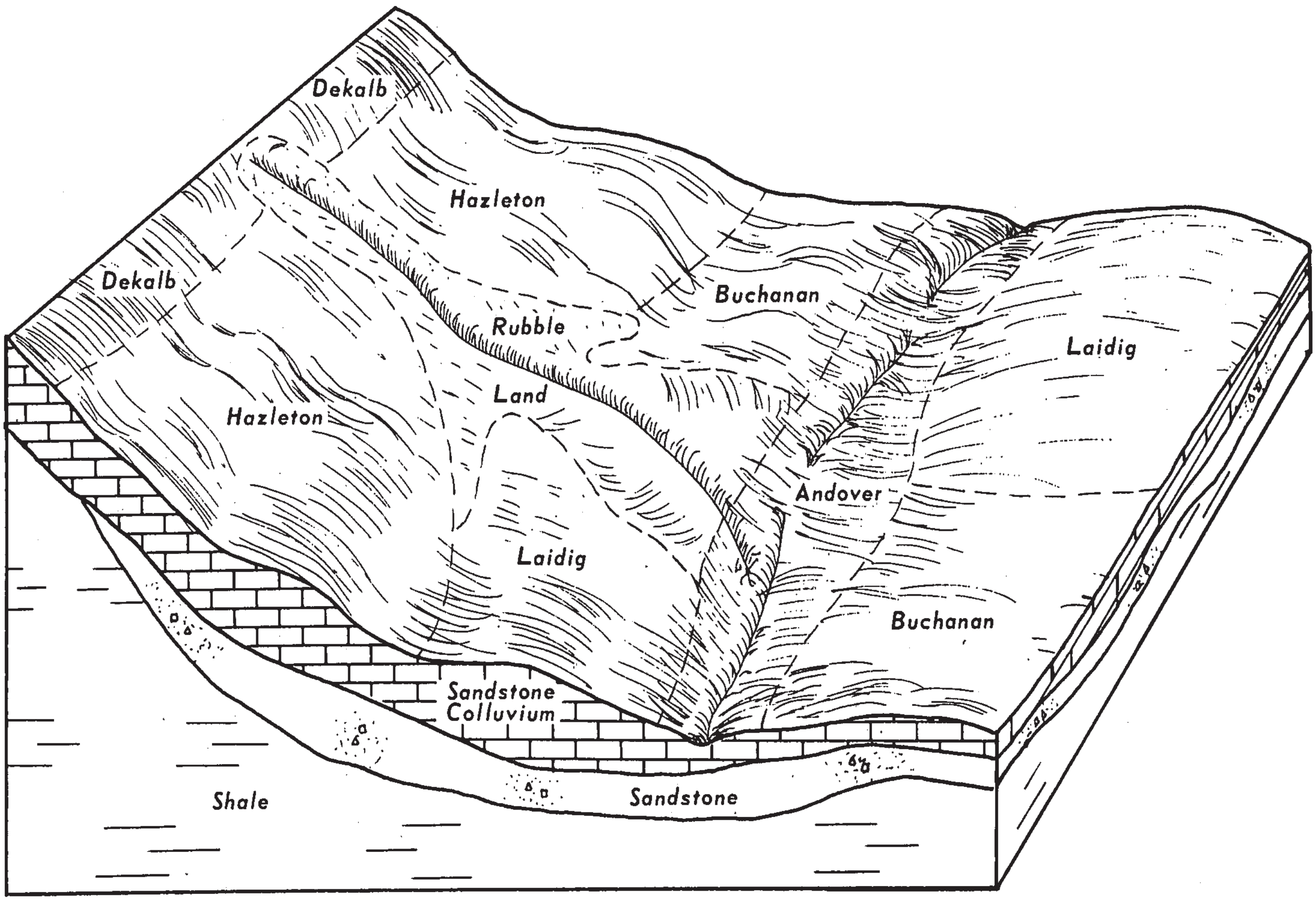


Figure 1.—Typical pattern of soils and underlying material of the Hazleton-Laidig-Buchanan association.

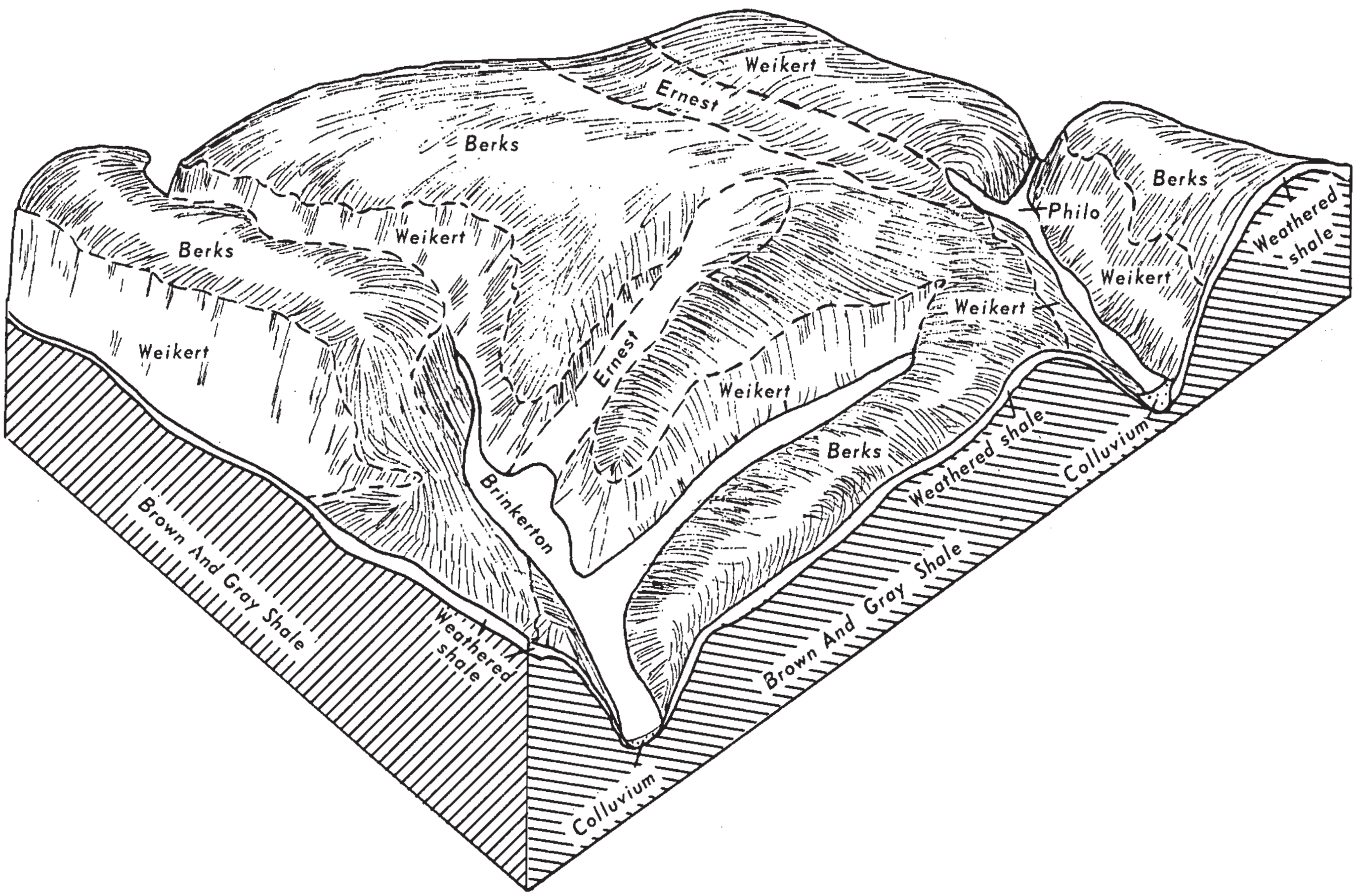


Figure 2.—Typical pattern of soils and underlying material of the Berks-Weikert association.

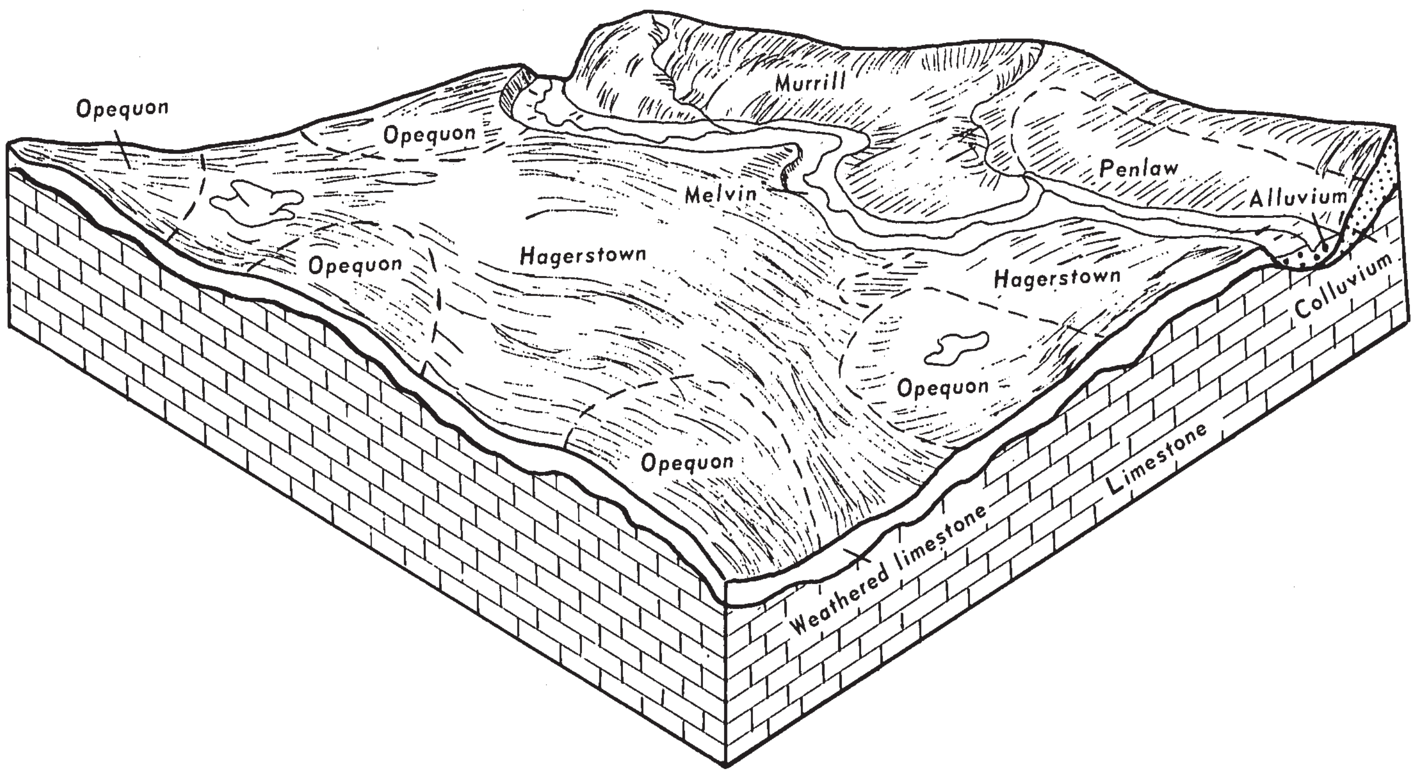


Figure 3.—Typical pattern of soils and underlying material of the Hagerstown-Opequon-Murrill association.

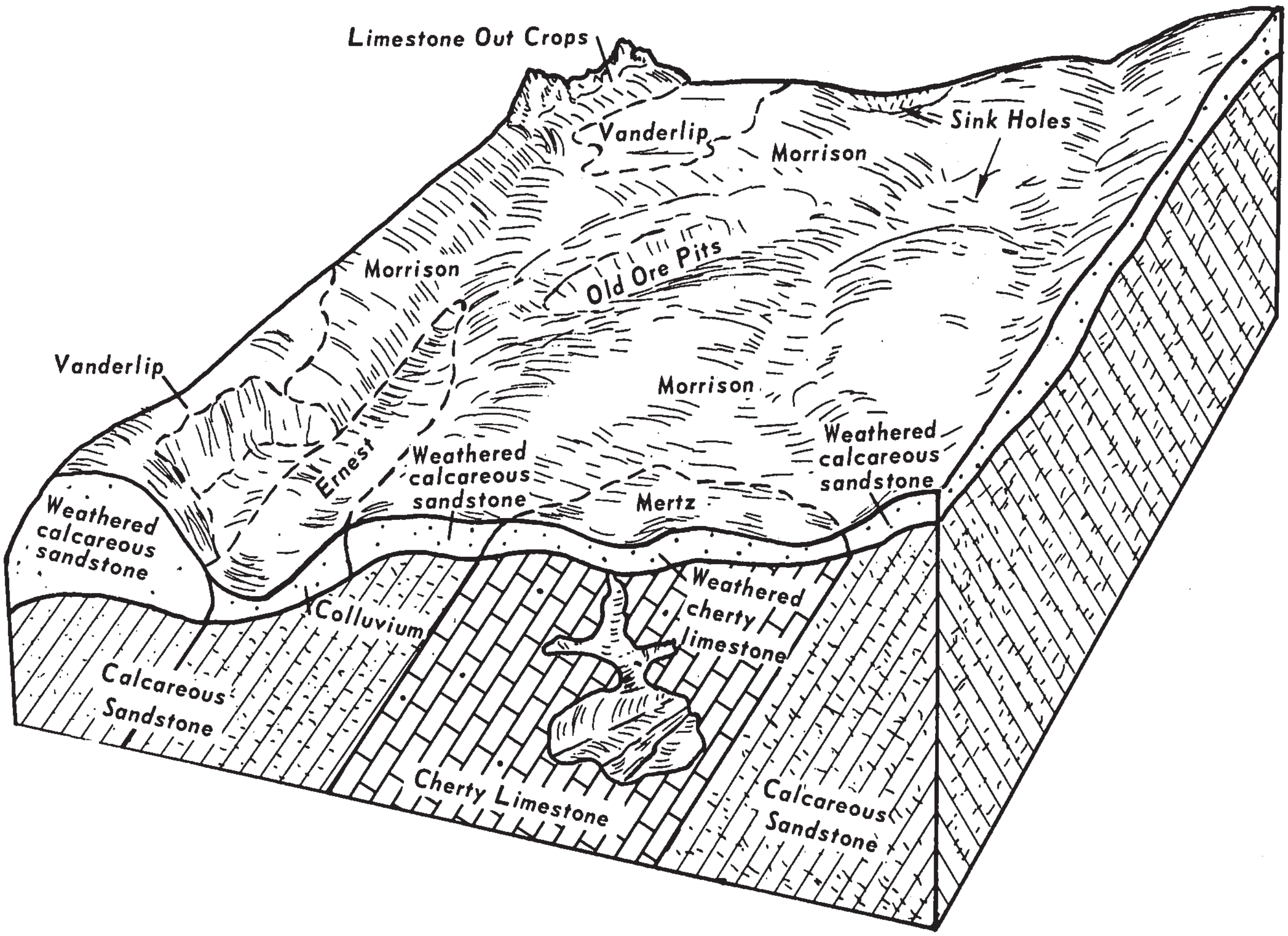


Figure 4.—Typical pattern of soils and underlying material of the Morrison association.

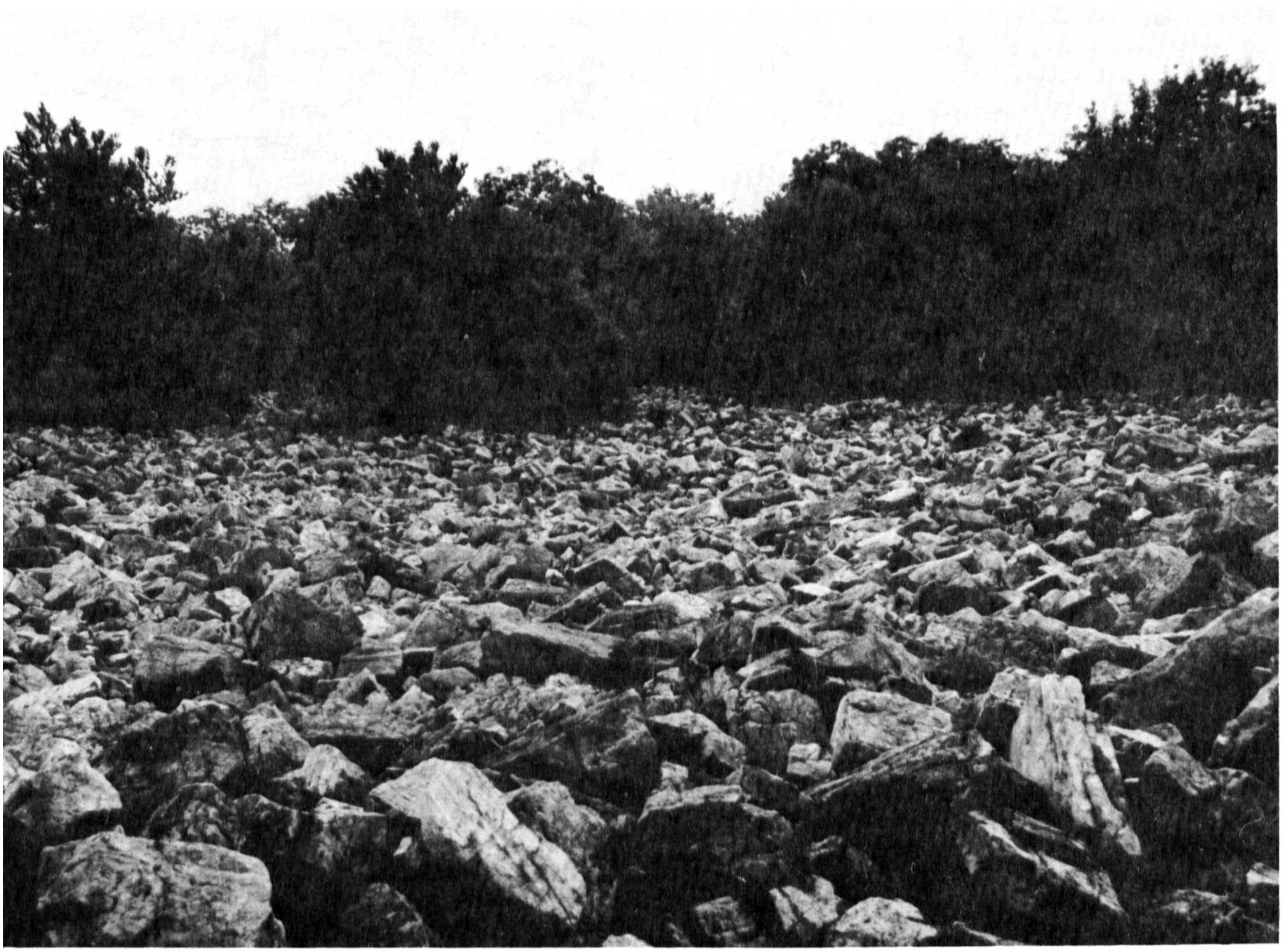


Figure 5.—Typical area of Rubble land.

Figure 6.—The yields are very good from this well-managed field of hay on Edom soils.

Figure 7.—Housing developments of this kind are common along the major highways in the survey area. The soil is Mertz cherty silt loam, 3 to 8 percent slopes.

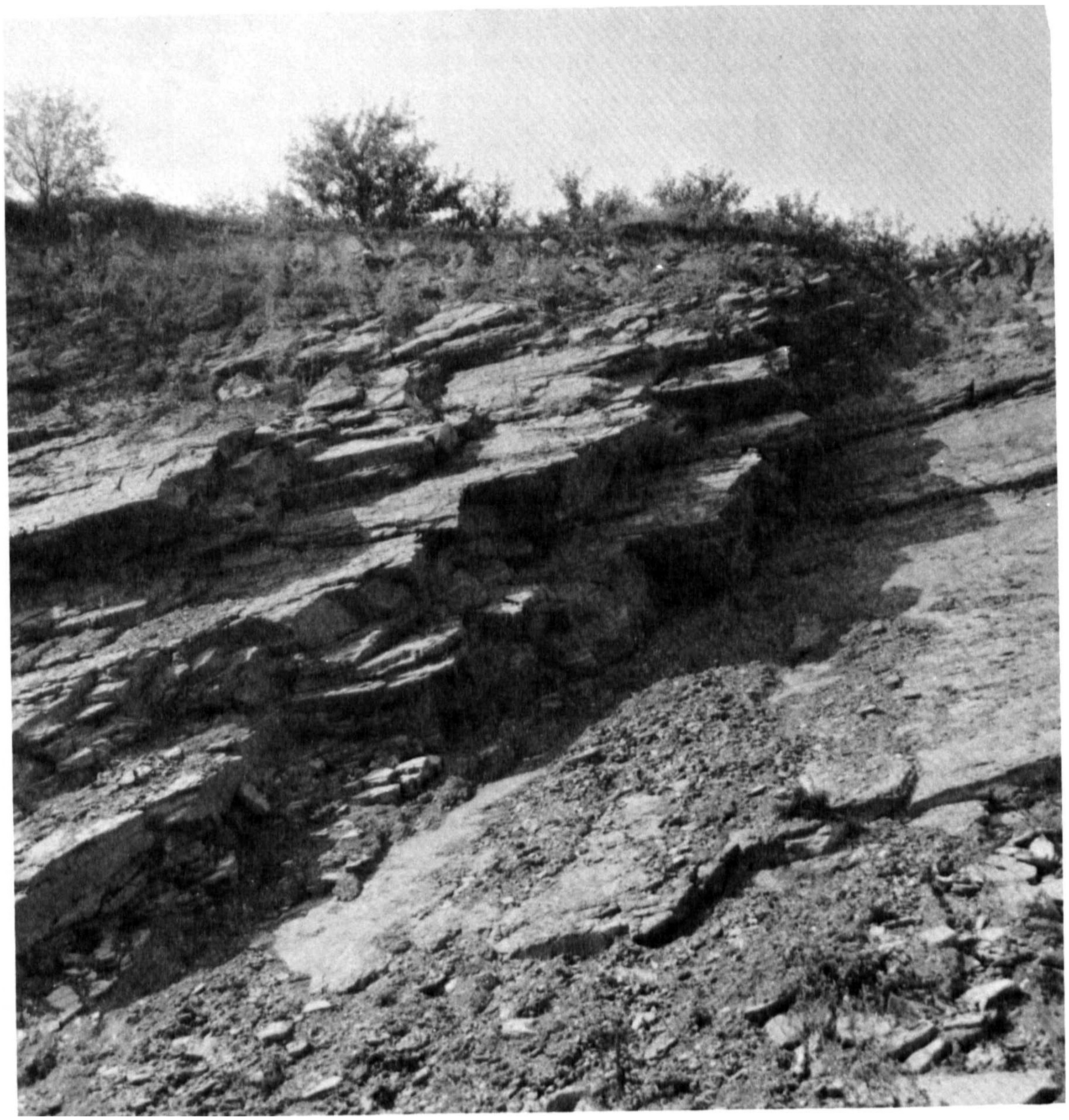


Figure 8.—Bedrock underlies the Edom soils at a depth of 40 to 72 inches or more.

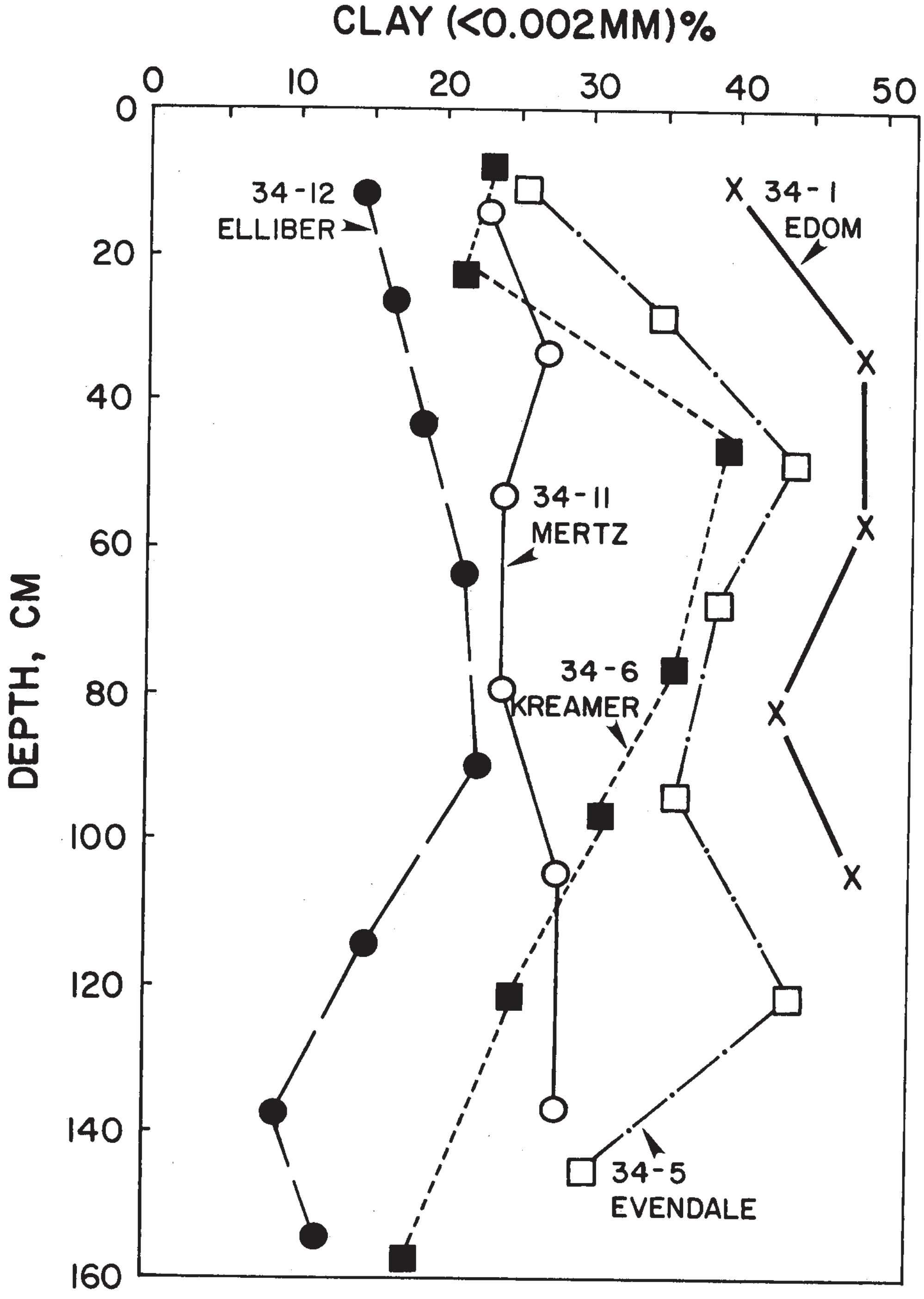


Figure 9.—Clay distribution in pedons of five representative series.

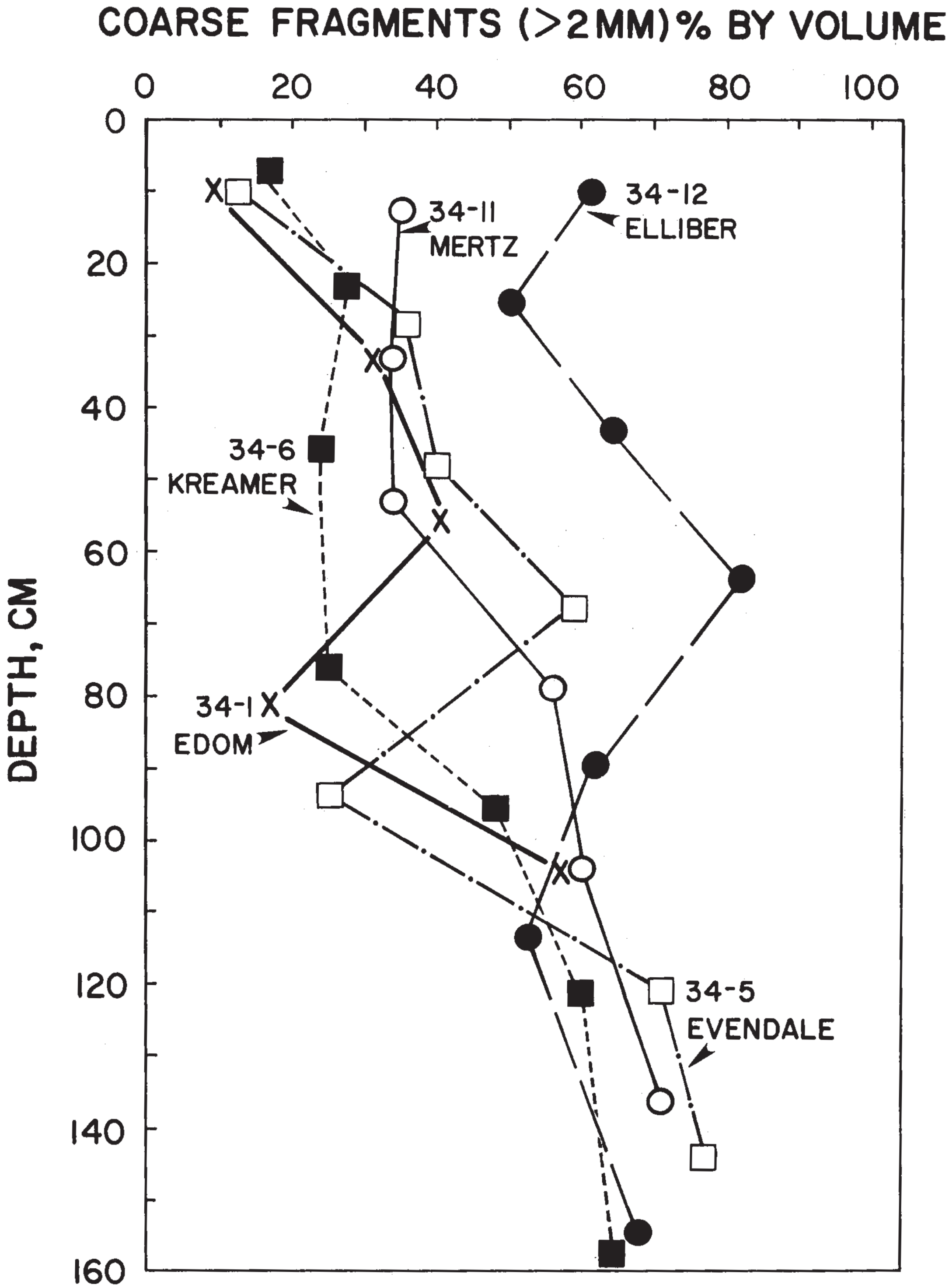


Figure 10.—Volume of coarse fragments in pedons of five representative series.

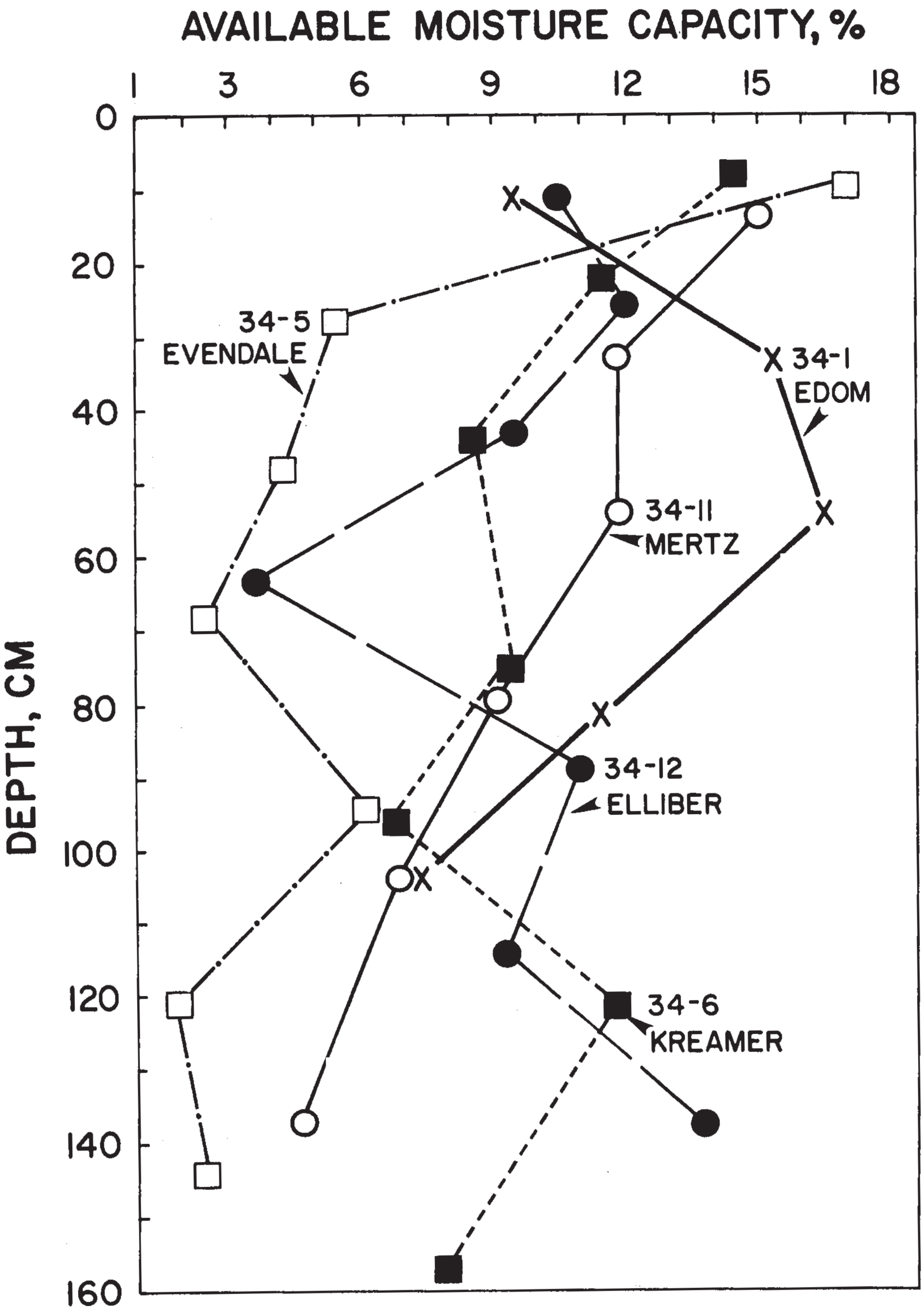


Figure 11.—Available moisture in pedons of five representative series.

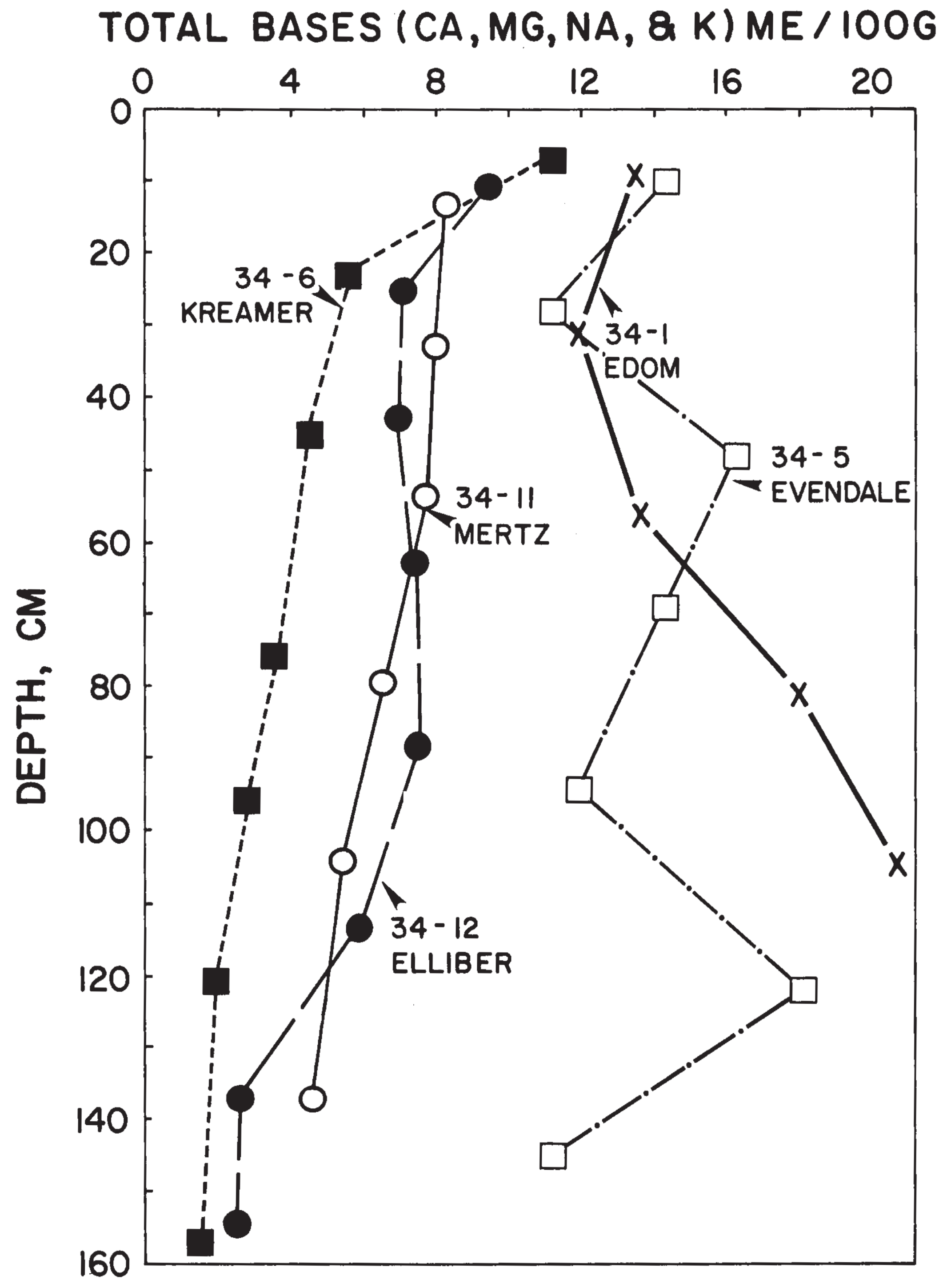


Figure 12.—Total exchangeable bases in pedons of five representative series.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data are from Lewistown, Mifflin County, Pennsylvania, 1941-70]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Temperature: Two years in 10 will have at least 4 days with-- Maximum temperature equal to or higher than--	Temperature: Two years in 10 will have at least 4 days with-- Minimum temperature equal to or lower than--	Precipitation: Average monthly total	Precipitation: One year in 10 will have-- Less than--	Precipitation: One year in 10 will have-- More than--	Precipitation: Days with snow cover	Precipitation: Average depth of snow on days with snow cover
	°F	°F	°F	°F	In	In	In		In
January---	37.8	20.5	52	1	2.26	1.36	3.54	11	4.0
February--	39.8	20.8	53	4	2.03	.96	3.36	9	3.0
March------	49.5	28.3	68	16	3.25	1.85	4.70	3	4.0
April------	62.6	38.2	82	25	3.20	1.33	5.14	<.5	0
May--------	73.7	47.4	90	35	4.02	1.44	7.34	0	0
June-------	82.2	56.4	93	44	3.68	1.89	5.36	0	0
July-------	86.2	60.8	95	50	3.78	2.04	5.46	0	0
August-----	84.5	59.2	94	47	3.57	1.92	5.25	0	0
September-	77.8	52.5	91	38	2.92	1.01	4.57	0	0
October---	67.3	41.7	83	29	3.09	1.10	5.44	0	0
November--	52.9	32.7	67	22	3.33	1.58	5.51	<.5	0
December--	39.8	23.3	55	10	2.53	.80	4.12	6	3.0
Year-----	62.8	40.2	97	-3	37.66	32.11	43.63	29	4.0

TABLE 2.--PROBABILITIES OF LAST FREEZING TEMPERATURES IN SPRING AND FIRST IN FALL

[Data are from Lewistown, Mifflin County, Pennsylvania, 1941-70]

Probability	Dates for given probability and temperature: 16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than--	Mar. 20	Apr. 4	Apr. 12	Apr. 24	May 12
2 years in 10 later than--	Mar. 14	Mar. 29	Apr. 9	Apr. 19	May 7
5 years in 10 later than--	Mar. 3	Mar. 17	Mar. 28	Apr. 10	Apr. 26
Fall:					
1 year in 10 earlier than--	Nov. 21	Nov. 12	Oct. 23	Oct. 12	Sep. 27
2 years in 10 earlier than--	Nov. 26	Nov. 18	Oct. 29	Oct. 19	Oct. 3
5 years in 10 earlier than--	Dec. 6	Nov. 29	Nov. 11	Oct. 28	Oct. 15

TABLE 3.--SOIL ASSOCIATIONS AND THEIR POTENTIAL AND LIMITATIONS FOR SPECIFIED USE

Soil association	Extent of area	Cultivated farm crops	Specialty crops	Woodland	Urban uses	Intensive recreation areas	Extensive recreation areas
	Pct						
1. Hazleton-Laidig-Buchanan	46	Poor: large stones, slope.	Poor: large stones, slope.	Good	Poor: large stones, slope.	Poor: large stones, slope.	Poor: large stones, slope.
2. Berks-Weikert	22	Fair: slope, droughty.	Fair: droughty.	Fair: droughty.	Poor: slope, depth to rock.	Poor: slope, small stones.	Poor: slope, small stones, depth to rock.
3. Hagerstown-Opequon-Murrill	10	Good	Good	Good	Fair: shrink-swell, depth to rock.	Fair: too clayey, shrink-swell.	Fair: too clayey, shrink-swell.
4. Edom-Klinesville-Weikert	7	Fair: slope, droughty.	Fair: slope, droughty.	Fair: droughty.	Fair: shrink-swell, depth to rock.	Poor: slope, small stones, shrink-swell.	Poor: slope, small stones, depth to rock.
5. Mertz-Elliber-Kreamer	7	Good	Good	Good	Fair: low strength.	Fair: small stones.	Fair: small stones.
6. Atkins-Monongahela-Allegheny[1]	5	Good	Good	Fair: wetness.	Poor: flooding, wetness.	Fair: flooding, wetness.	Fair: flooding, wetness.
7. Morrison	3	Good	Good	Good	Good	Good	Good.

[1]The rating of "good" for cultivated crops and specialty crops is for drained soils. The Atkins soils in this association are subject to flooding.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Juniata County	Mifflin County	Total-- Area	Extent
		Acres	Acres	Acres	Pct
AbB	Allegheny loam, 2 to 8 percent slopes	1,445	3,943	5,388	1.0
AdB	Allenwood gravelly silt loam, 2 to 8 percent slopes	890	15	905	0.2
AdC	Allenwood gravelly silt loam, 8 to 15 percent slopes	700	20	720	0.1
AdD	Allenwood gravelly silt loam, 15 to 25 percent slopes	165	0	165	(1)
AlB	Alvira silt loam, 2 to 8 percent slopes	1,020	5	1,025	0.2
AnB	Andover gravelly loam, 2 to 8 percent slopes	905	1,830	2,735	0.5
AoB	Andover extremely stony loam, 0 to 8 percent slopes	3,130	7,385	10,515	2.0
AoC	Andover extremely stony loam, 8 to 15 percent slopes	1,410	1,405	2,815	0.5
As	Ashton silt loam	155	880	1,035	0.2
At	Atkins silt loam	4,325	2,385	6,710	1.3
BkB	Berks shaly silt loam, 2 to 8 percent slopes	6,645	2,615	9,260	1.8
BkC	Berks shaly silt loam, 8 to 15 percent slopes	14,780	6,540	21,320	4.1
BlD	Berks-Weikert shaly silt loams, 15 to 25 percent slopes	12,875	5,155	18,030	3.4
BMF	Berks-Weikert association, steep	28,170	5,775	33,945	6.5
BrA	Brinkerton silt loam, 0 to 3 percent slopes	1,130	1,060	2,190	0.4
BrB	Brinkerton silt loam, 3 to 8 percent slopes	6,955	3,525	10,480	2.0
BuB	Buchanan gravelly loam, 3 to 8 percent slopes	2,005	3,610	5,615	1.1
BuC	Buchanan gravelly loam, 8 to 15 percent slopes	1,295	1,585	2,880	0.5
BxB	Buchanan extremely stony loam, 3 to 8 percent slopes	2,945	3,110	6,055	1.2
BxD	Buchanan extremely stony loam, 8 to 15 percent slopes	5,285	8,700	13,985	2.7
CaB	Chavies loam, 2 to 8 percent slopes	515	1,135	1,650	0.3
EdB	Edom silty clay loam, 3 to 8 percent slopes	2,100	1,580	3,680	0.7
EdC	Edom silty clay loam, 8 to 15 percent slopes	2,215	3,325	5,540	1.1
EdD	Edom silty clay loam, 15 to 25 percent slopes	1,000	1,365	2,365	0.5
EeB	Edom-Klinesville complex, 3 to 8 percent slopes	945	755	1,700	0.3
EeC	Edom-Klinesville complex, 8 to 15 percent slopes	1,845	790	2,635	0.5
EeD	Edom-Klinesville complex, 15 to 25 percent slopes	590	360	950	0.2
EfB	Edom-Weikert complex, 3 to 8 percent slopes	2,130	1,015	3,145	0.6
EfC	Edom-Weikert complex, 8 to 15 percent slopes	3,445	1,490	4,935	0.9
EfD	Edom-Weikert complex, 15 to 25 percent slopes	1,875	1,130	3,005	0.6
ElB	Elliber very cherty loam, 3 to 8 percent slopes	365	185	550	0.1
ElC	Elliber very cherty loam, 8 to 15 percent slopes	1,090	875	1,965	0.4
ElD	Elliber very cherty loam, 15 to 25 percent slopes	1,165	900	2,065	0.4
ElF	Elliber very cherty loam, 25 to 60 percent slopes	3,210	1,705	4,915	0.9
ErB	Ernest silt loam, 2 to 8 percent slopes	4,270	1,770	6,040	1.2
ErC	Ernest silt loam, 8 to 15 percent slopes	1,155	1,125	2,280	0.4
Ev	Evendale cherty silt loam	500	400	900	0.2
HaB	Hagerstown silt loam, 2 to 8 percent slopes	105	9,715	9,820	1.9
HcB	Hagerstown silty clay loam, 3 to 8 percent slopes	270	4,705	4,975	1.0
HcC	Hagerstown silty clay loam, 8 to 15 percent slopes	320	5,485	5,805	1.1
HcD	Hagerstown silty clay loam, 15 to 25 percent slopes	80	700	780	0.1
HeB	Hagerstown-Rock outcrop complex, 0 to 8 percent slopes	0	330	330	0.1
HeD	Hagerstown-Rock outcrop complex, 8 to 25 percent slopes	5	1,165	1,170	0.2
HhB	Hazleton channery loam, 3 to 8 percent slopes	370	200	570	0.1
HhC	Hazleton channery loam, 8 to 15 percent slopes	940	650	1,590	0.3
HhD	Hazleton channery loam, 15 to 25 percent slopes	645	570	1,215	0.2
HSB	Hazleton-Dekalb extremely stony sandy loams, gently sloping	5,295	3,145	8,440	1.6
HSD	Hazleton-Dekalb extremely stony sandy loams, moderately steep	4,155	15,145	19,300	3.7
HTF	Hazleton-Dekalb association, steep	29,005	58,920	87,925	16.8
KlB	Klinesville shaly silt loam, 3 to 8 percent slopes	675	355	1,030	0.2
KlC	Klinesville shaly silt loam, 8 to 15 percent slopes	2,070	1,580	3,650	0.7
KlD	Klinesville shaly silt loam, 15 to 25 percent slopes	1,105	1,115	2,220	0.4
KlF	Klinesville shaly silt loam, 25 to 50 percent slopes	375	385	760	0.1
KrB	Kreamer cherty silt loam, 2 to 8 percent slopes	2,600	705	3,305	0.6
KrC	Kreamer cherty silt loam, 8 to 15 percent slopes	380	165	545	0.1
LaB	Laidig channery loam, 3 to 8 percent slopes	655	525	1,180	0.2
LaC	Laidig channery loam, 8 to 15 percent slopes	1,205	1,270	2,475	0.5
LaD	Laidig channery loam, 15 to 25 percent slopes	210	305	515	0.1
LcB	Laidig extremely stony loam, 3 to 8 percent slopes	645	1,490	2,135	0.4
LcD	Laidig extremely stony loam, 8 to 25 percent slopes	16,740	26,240	42,980	8.2
LDF	Laidig extremely stony loam, steep	3,670	3,160	6,830	1.3
LtB	Leetonia extremely stony loamy sand, 0 to 12 percent slopes	450	3,125	3,575	0.7
Ma	Melvin silt loam	750	1,560	2,310	0.4
MeB	Mertz cherty silt loam, 3 to 8 percent slopes	2,355	1,785	4,140	0.8
MeC	Mertz cherty silt loam, 8 to 15 percent slopes	4,365	3,675	8,040	1.5
MeD	Mertz cherty silt loam, 15 to 25 percent slopes	2,585	2,240	4,825	0.9
MnB	Millheim silt loam, 3 to 8 percent slopes	0	310	310	0.1
MnC	Millheim silt loam, 8 to 15 percent slopes	0	515	515	0.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Juniata County	Mifflin County	Total-- Area	Extent
		Acres	Acres	Acres	Pct
MoA	Monongahela silt loam, 0 to 3 percent slopes	500	895	1,395	0.3
MoB	Monongahela silt loam, 3 to 8 percent slopes	2,910	2,055	4,965	0.9
MrB	Morrison gravelly sandy loam, 3 to 8 percent slopes	2,875	885	3,760	0.7
MrC	Morrison gravelly sandy loam, 8 to 15 percent slopes	5,795	1,915	7,710	1.5
MrD	Morrison gravelly sandy loam, 15 to 25 percent slopes	4,040	830	4,870	0.9
MuB	Murrill gravelly loam, 3 to 8 percent slopes	1,410	3,160	4,570	0.9
MuC	Murrill gravelly loam, 8 to 15 percent slopes	540	1,835	2,375	0.5
Ne	Newark silt loam	415	220	635	0.1
No	Nolin silt loam	735	1,720	2,455	0.5
OpB	Opequon silty clay loam, 3 to 8 percent slopes	325	2,120	2,445	0.5
OpC	Opequon silty clay loam, 8 to 15 percent slopes	670	3,675	4,345	0.8
OpD	Opequon silty clay loam, 15 to 25 percent slopes	645	2,270	2,915	0.6
ORF	Opequon-Hagerstown complex, steep	1,200	4,530	5,730	1.1
Pe	Penlaw silt loam	590	805	1,395	0.3
Ph	Philo silt loam	1,365	1,775	3,140	0.6
Po	Pope soils	320	510	830	0.2
Pu	Purdy silt loam	1,715	1,380	3,095	0.6
Ru	Rubble land	3,620	9,005	12,625	2.4
Ty	Tyler silt loam	1,490	1,435	2,925	0.6
VaC	Vanderlip loamy sand, 5 to 15 percent slopes	60	495	555	0.1
WaB	Watson gravelly silt loam, 2 to 8 percent slopes	1,110	30	1,140	0.2
WaC	Watson gravelly silt loam, 8 to 15 percent slopes	250	0	250	(1)
WeB	Weikert shaly silt loam, 3 to 8 percent slopes	860	455	1,315	0.3
WeC	Weikert shaly silt loam, 8 to 15 percent slopes	2,235	600	2,835	0.5
WeD	Weikert shaly silt loam, 15 to 25 percent slopes	3,255	970	4,225	0.8
	Pits and quarries	331	0	331	0.1
	Water	1,749	1,587	3,336	0.6
	Total	247,680	275,840	523,520	100.0

[1]Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. The estimates were made in 1975. Absence of a yield figure indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only arable soils are listed]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM[1]
Allegheny:							
AbB	115	23	75	45	4.5	3.5	8.5
Allenwood:							
AdB	120	24	75	45	4.5	3.5	8.5
AdC	110	22	70	40	4.0	3.0	8.0
AdD	95	19	60	35	4.0	3.0	8.0
Alvira:							
AlB	80	16	65	35	3.5	3.0	6.0
Andover:							
AnB	85	17	60	---	---	2.5	5.0
Ashton:							
As	140	28	80	50	5.5	3.5	10.5
Atkins:							
At	100	20	60	30	---	3.0	5.5
Berks:							
BkB	80	16	60	35	3.5	3.0	6.5
BkC	75	15	55	35	3.0	2.5	5.5
[2]BlD:							
Berks part	70	14	50	80	3.0	2.0	5.5
Brinkerton:							
BrA	90	18	60	---	---	2.5	5.0
BrB	90	18	60	---	---	2.5	5.0
Buchanan:							
BuB	100	20	65	40	3.5	7.0	7.0
BuC	90	8	60	35	3.5	3.0	7.0
Chavies:							
CaB	125	25	75	45	4.5	3.5	8.5
Edom:							
EdB	100	20	70	40	4.0	3.0	8.0
EdC	90	18	65	35	3.5	3.0	7.0
EdD	80	16	60	35	3.0	2.5	6.0
[2]EeB:							
Edom part	100	70	70	40	4.0	3.0	8.0
Klinesville part	60	2	55	25	2.5	2.0	5.0
[2]EeC:							
Edom part	90	18	65	35	3.5	3.0	7.0
Klinesville part	---	---	50	---	2.5	2.0	5.0
[2]EeD:							
Edom part	80	16	60	35	3.0	2.5	6.0
[2]EfB:							
Edom part	100	70	40	40	4.0	3.0	8.0
Weikert part	60	12	50	25	---	2.0	4.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM[1]
Edom:							
[2]EfC:							
Edom part	90	18	65	35	3.5	3.0	7.0
Weikert part	---	---	---	---	---	2.0	4.0
[2]EfD:							
Edom part	80	16	60	35	3.0	2.5	6.0
Elliber:							
ElB	100	20	65	35	3.5	2.5	7.0
ElC	95	19	60	35	3.5	2.5	7.0
Ernest:							
ErB	100	20	65	40	3.5	3.0	7.0
ErC	90	18	60	35	3.5	3.0	7.0
Evendale:							
Ev	85	17	65	35	3.5	3.0	7.0
Hagerstown:							
HaB	135	27	80	50	5.5	3.5	9.5
HcB	125	25	75	45	5.0	3.5	8.5
HcC	120	24	70	40	4.5	3.0	8.5
HcD	110	22	65	35	4.0	3.0	8.0
[2]HeB:							
Hagerstown part	120	24	70	40	4.5	3.0	8.5
Rock outcrop part.							
[2]HeD:							
Hagerstown part	1 0	22	65	35	4.0	3.0	8.0
Rock outcrop part.							
Hazleton:							
HhB	125	25	75	45	4.5	3.5	8.5
HhC	115	23	70	40	4.0	3.5	8.0
HhD	100	20	60	35	4.0	3.0	8.0
Klinesville:							
KlB	60	12	55	25	2.5	2.0	5.0
KlC	---	---	50	20	2.5	2.0	5.0
Kreamer:							
KrB	105	21	70	45	3.5	3.0	7.0
KrC	95	19	65	30	3.5	3.0	7.0
Laidig:							
LaB	100	20	70	40	4.0	3.0	7.5
LaC	95	19	65	35	4.0	3.0	7.5
LaD	85	17	60	30	3.5	2.5	6.5
Melvin:							
Ma	110	22	70	---	---	3.0	6.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM[1]
Mertz:							
MeB	110	22	70	45	4.5	3.5	8.5
MeC	105	21	65	40	4.0	3.0	8.0
MeD	100	20	65	40	3.5	2.5	7.0
Millheim:							
MnB	100	20	65	40	4.0	3.0	7.0
MnC	90	18	60	35	3.5	3.0	6.5
Monongahela:							
MoA	100	20	65	40	3.5	3.0	6.5
MoB	100	20	65	40	3.5	3.0	6.5
Morrison:							
MrB	100	20	60	40	4.0	3.5	7.0
MrC	95	19	55	35	3.5	3.5	6.5
MrD	90	18	50	30	3.0	3.0	6.0
Murrill:							
MuB	120	24	75	45	4.5	3.5	8.5
MuC	110	22	70	40	4.0	3.0	7.5
Newark:							
Ne	130	26	80	45	4.5	3.5	8.5
Nolin:							
No	135	27	80	45	4.5	3.5	9.5
Opequon:							
OpB	75	15	---	25	3.0	2.5	6.0
OpC	70	14	---	25	3.0	2.5	6.0
OpD	---	---	---	---	2.5	2.0	5.0
Penlaw:							
Pe	95	19	65	40	3.5	2.5	6.5
Philo:							
Ph	130	26	80	45	4.5	3.5	8.5
Pope:							
Po	135	27	80	50	5.0	3.5	9.5
Purdy:							
Pu	80	16	55	---	---	2.5	5.0
Tyler:							
Ty	95	19	60	---	3.0	3.0	5.5
Vanderlip:							
VaC	70	14	55	30	3.0	2.5	5.0
Watson:							
WaB	100	20	70	40	3.5	3.0	6.5
WaC	90	18	65	40	3.5	3.0	6.5
Weikert:							
WeB	60	12	50	25	2.0	2.0	4.0
WeC	---	---	40	20	2.0	2.0	4.0

[1] Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

[2] This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	4,320	---	---	---
II	81,288	76,118	5,170	---
III	83,510	74,405	8,555	550
IV	75,280	47,550	25,210	2,520
V	---	---	---	---
VI	12,925	9,690	---	3,235
VII	249,905	40,435	---	209,470
VIII	12,625	---	---	12,625

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
Allegheny: AbB	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Virginia pine Eastern white pine Sugar maple	80 90 75 90 80	Eastern white pine, Austrian pine, yellow-poplar, black walnut, European larch, red pine, Norway spruce, black cherry.
Allenwood: AdB, AdC	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	70 80 70	Eastern white pine, European larch, yellow-poplar, Norway spruce, Virginia pine.
AdD	3r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	70 80 70	Eastern white pine, European larch, yellow-poplar, Norway spruce, Virginia pine.
Alvira: AlB	3w	Slight	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	70 80 70 70	Eastern white pine, yellow-poplar, Norway spruce, European larch, white spruce.
Andover: AnB	3w	Slight	Severe	Severe	Moderate	Northern red oak Yellow-poplar White ash Red maple	75 83 70 70	Eastern white pine, European larch, white spruce.
AoB	3x	Slight	Severe	Severe	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	70 75 70 70	Eastern white pine, European larch, Norway spruce.
AoC	3x	Moderate	Severe	Severe	Moderate	Northern red oak Yellow-poplar White ash Red maple	70 75 70 70	Eastern white pine, European larch, white spruce.
Ashton: As	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black walnut White ash Black cherry	85 95 80 85 85	Eastern white pine, yellow-poplar, black walnut, black cherry, Norway spruce, European larch.
Atkins: At	2w	Slight	Severe	Severe	Moderate	Pin oak American sycamore Red maple	80 80 70	Eastern white pine, white spruce.
Berks: BkB, BkC	3f	Slight	Slight	Moderate	Slight	Northern red oak Eastern white pine Virginia pine Black oak	70 75 70 70	Red pine, eastern white pine, Norway spruce, European larch.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Berks:								
[1]BlD:								
Berks part	3f	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine Eastern white pine	70 70 70 75	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
Weikert part	4d	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, Virginia pine, Norway spruce, red pine.
[1]BMF:								
Berks part	3f	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine Eastern white pine	70 70 70 70	Virginia pine, eastern white pine, European larch, Norway spruce, red pine.
Weikert part	4d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	64 60	Eastern white pine, Virginia pine, Norway spruce, red pine.
Brinkerton:								
BrA, BrB	2w	Slight	Severe	Severe	Moderate	Northern red oak Pin oak Red maple Yellow-poplar	75 80 70 85	Eastern white pine, white spruce.
Buchanan:								
BuB, BuC	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	70 80 65 65	Northern red oak, yellow-poplar, sugar maple, eastern white pine, European larch, Norway spruce.
BxB, BxD	3x	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	70 80 65 65	Northern red oak, yellow-poplar, sugar maple, eastern white pine, European larch, Norway spruce.
Chavies:								
CaB	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Black walnut Black cherry Sugar maple	80 90 80 70 80 80	Eastern white pine, yellow-poplar, black walnut, Norway spruce, European larch, red pine.
Edom:								
EdB, EdC	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
EdD	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
[1]EeB:								
Edom part	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
Edom:								
Klinesville part	4d	Slight	Slight	Moderate	Slight	Virginia pine Chestnut oak Black oak	60 60 60	Virginia pine, eastern white pine, Norway spruce.
[1]EeC:								
Edom part	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
Klinesville part	4d	Slight	Slight	Moderate	Slight	Virginia pine Chestnut oak Black oak	60 60 60	Virginia pine, eastern white pine, Norway spruce.
[1]EeD:								
Edom part	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
Klinesville part	4d	Slight	Moderate	Moderate	Slight	Virginia pine Chestnut oak Black oak	60 60 60	Red pine, eastern white pine, Norway spruce.
[1]EfB:								
Edom part	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
Weikert part	4d	Slight	Slight	Severe	Slight	Virginia pine Chestnut oak Black oak	60 60 60	Red pine, eastern white pine, Norway spruce.
[1]EfC:								
Edom part	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
Weikert part	4d	Slight	Slight	Severe	Slight	Virginia pine Chestnut oak Black oak	60 60 60	Red pine, eastern white pine, Norway spruce.
[1]EfD:								
Edom part	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, red pine.
Weikert part	4d	Slight	Moderate	Severe	Slight	Black oak Virginia pine Chestnut oak	60 60 60	Eastern white pine, red pine, Norway spruce.
Elliber:								
ElB, ElC	2f	Slight	Slight	Moderate	Slight	Northern red oak Yellow-poplar Black walnut White ash	80 90 70 80	Eastern white pine, European larch, Norway spruce, black walnut, yellow-poplar, black locust.
ElD	2f	Slight	Moderate	Moderate	Slight	Northern red oak Yellow-poplar Black walnut White ash	80 90 70 80	Eastern white pine, European larch, Norway spruce, black walnut, yellow-poplar, black locust.
ElF	2f	Moderate	Severe	Moderate	Slight	Northern red oak Yellow-poplar White ash	75 85 75	Eastern white pine, European larch, Norway spruce, yellow-poplar, black locust.

See footnote at end of table

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Ernest:								
ErB----------------	2w	Slight	Moderate	Slight	Slight	Northern red oak---- Sugar maple--------- Yellow-poplar------- White ash-----------	80 80 90 80	Eastern white pine, yellow-poplar, Norway spruce, European larch.
ErC----------------	2w	Moderate	Moderate	Slight	Slight	Northern red oak---- Sugar maple--------- Yellow-poplar------- White ash-----------	80 80 90 80	Eastern white pine, yellow-poplar, Norway spruce, European larch.
Evendale:								
Ev-----------------	2w	Slight	Severe	Moderate	Moderate	Northern red oak---- Yellow-poplar------- White ash----------- Sugar maple---------	80 90 80 80	Eastern white pine, yellow-poplar, Norway spruce, European larch.
Hagerstown:								
HaB, HcB, HcC------	1c	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- White ash----------- Sugar maple---------	85 95 75 85 85	Black walnut, yellow-poplar, eastern white pine, Norway spruce, European larch.
HcD----------------	1c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- White ash----------- Sugar maple---------	85 95 75 85 85	Black walnut, yellow-poplar, eastern white pine, Norway spruce, European larch, red pine.
[1]HeB:								
Hagerstown part-	1c	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- White ash----------- Sugar maple---------	85 95 75 85 85	Black walnut, yellow-poplar, eastern white pine, Norway spruce, European larch, red pine.
Rock outcrop part.								
[1]HeD:								
Hagerstown part-	1c	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- White ash----------- Sugar maple---------	85 95 75 85 85	Black walnut, yellow-poplar, eastern white pine, Norway spruce, European larch, red pine.
Rock outcrop part.								
Hazleton:								
HhB, HhC-----------	3o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- White ash----------- Sugar maple---------	70 80 70 70	European larch, eastern white pine, Norway spruce, red pine, yellow-poplar.
HhD----------------	3r	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- White ash----------- Sugar maple---------	70 80 70 70	European larch, eastern white pine, Norway spruce, red pine, yellow-poplar.
[1]HSB:								
Hazleton part---	3o	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- White ash----------- Sugar maple---------	70 80 70 70	European larch, eastern white pine, Norway spruce, yellow-poplar, red pine.
Dekalb part------	4x	Slight	Moderate	Moderate	Slight	Northern red oak---- Yellow poplar------- Sugar maple---------	60 70 60	Eastern white pine, European larch, Norway spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Important trees	Site index	
Hazleton:								
[1]HSD:								
Hazleton part	3r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	70 80 70	European larch, eastern white pine, Norway spruce, red pine.
Dekalb part	4x	Slight	Moderate	Moderate	Slight	Northern red oak Sugar maple	65 65	Eastern white pine, red pine, Norway spruce.
[1]HTF:								
Hazleton part	3r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar	70 80	European larch, eastern white pine, Norway spruce, red pine.
Dekalb part	4x	Moderate	Severe	Moderate	Slight	Northern red oak Sugar maple	65 65	Eastern white pine, red pine, Norway spruce.
Klinesville:								
KlB, KlC	4d	Slight	Slight	Moderate	Moderate	Virginia pine Northern red oak Chestnut oak Black oak	60 60 60 60	Red pine, eastern white pine, Norway spruce.
KlD	4d	Slight	Moderate	Moderate	Moderate	Virginia pine Northern red oak Chestnut oak Black oak	60 60 60 60	Red pine, eastern white pine, Norway spruce.
KlF	4d	Moderate	Severe	Moderate	Moderate	Virginia pine Northern red oak Chestnut oak Black oak	60 60 60 60	Red pine, eastern white pine.
Kreamer:								
KrB	3w	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	70 80 70 70	Eastern white pine, yellow-poplar, Norway spruce, European larch.
KrC	3w	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	70 80 70 70	Eastern white pine, yellow-poplar, Norway spruce, European larch.
Laidig:								
LaB, LaC	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple	70 85 80 70	Eastern white pine, yellow-poplar, red pine, Virginia pine, European larch, Norway spruce.
LaD	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple	70 85 80 70	Eastern white pine, yellow-poplar, red pine, Virginia pine, European larch, Norway spruce.
LcB	2x	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple	70 80 80 70	Eastern white pine, yellow-poplar, red pine, Virginia pine, Norway spruce.
LcD	2x	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple	70 80 80 70	Eastern white pine, yellow-poplar, red pine, Virginia pine, Norway spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
Laidig: LDF	3x	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple	65 75 75 65	Eastern white pine, red pine, Virginia pine, Norway spruce.
Leetonia: LtB	5x	Slight	Moderate	Severe	Slight	Black oak Chestnut oak	55 55	Virginia pine, pitch pine, Austrian pine.
Melvin: Ma	3w	Slight	Severe	Severe	Slight	Red maple	65	Eastern white pine, white spruce.
Mertz: MeB, MeC	2f	Slight	Slight	Moderate	Slight	Northern red oak Virginia pine Yellow-poplar White ash	80 80 90 80	Yellow-poplar, eastern white pine, European larch, Norway spruce, Virginia pine, black locust.
MeD	2r	Slight	Moderate	Moderate	Slight	Northern red oak Virginia pine Yellow-poplar White ash	80 80 90 80	Yellow-poplar, eastern white pine, European larch, Norway spruce, Virginia pine, black locust.
Millheim: MnB, MnC	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	85 95 85 80	Eastern white pine, black walnut, European larch, yellow-poplar, red pine, Norway spruce.
Monongahela: MoA, MoB	3w	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Sugar maple White ash	70 80 75 70 70	Eastern white pine, white spruce, Virginia pine, yellow-poplar, black cherry, European larch.
Morrison: MrB, MrC	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black oak Eastern white pine Sugar maple White ash	70 80 70 75 70 70	Eastern white pine, yellow-poplar, Norway spruce, red pine, Virginia pine, European larch, black locust.
MrD	3r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Black oak Eastern white pine Sugar maple White ash	70 80 70 75 70 70	Eastern white pine, yellow-poplar, Norway spruce, red pine, Virginia pine, European larch, Black locust.
Murrill: MuB, MuC	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	70 80 70 70	Eastern white pine, yellow-poplar, black walnut, Norway spruce, Virginia pine, European larch, black locust.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
Newark:								
Ne	2w	Slight	Moderate	Slight	Moderate	Northern red oak Yellow-poplar Black oak White ash	85 95 85 85	Norway spruce, white spruce, eastern white pine, yellow-poplar, European larch.
Nolin:								
No	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black oak White ash Sugar maple	85 95 85 85 85	Norway spruce, yellow-poplar, eastern white pine, black locust, black walnut.
Opequon:								
OpB, OpC	3c	Moderate	Slight	Moderate	Moderate	Northern red oak Yellow-poplar	65 75	Virginia pine, eastern white pine.
OpD	3c	Severe	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar	65 75	Virginia pine, eastern white pine.
[1]ORF:								
Opequon part	3c	Severe	Severe	Moderate	Moderate	Northern red oak Yellow-poplar Chestnut oak	65 75 65	Virginia pine, eastern white pine.
Hagerstown part	2c	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar White ash Chestnut oak	80 90 80 80	Yellow-poplar, eastern white pine, Norway spruce, red pine.
Penlaw:								
Pe	2w	Slight	Moderate	Moderate	Moderate	Northern red oak White ash Sugar maple Red maple Yellow-poplar	80 80 80 80 90	Yellow-poplar, European larch, Norway spruce, white spruce, eastern white pine.
Philo:								
Ph	2w	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Sugar maple White ash	85 100 85 85	Eastern white pine, yellow-poplar, black walnut, Norway spruce, European larch.
Pope:								
Po	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Sugar maple	85 100 85 85	Eastern white pine, yellow-poplar, black walnut, black cherry, Norway spruce, European larch.
Purdy:								
Pu	3w	Slight	Severe	Severe	Moderate	Red maple Virginia pine	65 60	Eastern white pine, white spruce.
Rubble land Ru.								
Tyler:								
Ty	2w	Slight	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar Sugar maple Black walnut White ash	80 90 80 --- 80	Eastern white pine, yellow-poplar, white spruce, European larch.
Vanderlip:								
VaC	3s	Slight	Moderate	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Eastern white pine, Virginia pine, red pine, European larch, Norway spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Important trees	Potential productivity: Site index	Trees to plant
Watson:								
WaB, WaC	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Eastern white pine,
						Sugar maple	70	yellow-poplar,
						Yellow-poplar	80	European larch,
						White ash	70	Norway spruce,
								black cherry.
WeB, WeC	4d	Slight	Slight	Severe	Moderate	Northern red oak	60	Virginia pine,
						Virginia pine	60	eastern white pine,
						Chestnut oak	60	red pine,
						Black oak	60	pitch pine.
Weikert:								
WeD	4d	Slight	Moderate	Severe	Moderate	Northern red oak	60	Eastern white pine,
						Virginia pine	60	Virginia pine,
						Chestnut oak	60	red pine,
						Black oak	60	pitch pine.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Allegheny:					
AbB	Slight	Moderate: frost action.	Slight	Moderate: slope, frost action.	Moderate: frost action, low strength.
Allenwood:					
AdB	Slight	Moderate: frost action.	Slight	Moderate: slope, frost action.	Moderate: frost action.
AdC	Moderate: slope.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
AdD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Alvira:					
AlB	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.
Andover:					
AnB	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.
AoB	Severe: large stones, wetness.	Severe: large stones, wetness, frost action.	Severe: large stones, wetness.	Severe: large stones, wetness, frost action.	Severe: wetness, frost action.
AoC	Severe: large stones, wetness.	Severe: large stones, frost action, wetness.	Severe: large stones, wetness.	Severe: slope, wetness, large stones.	Severe: wetness, frost action.
Ashton:					
As.	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Atkins:					
At	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness, frost action.
Berks:					
BkB	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight
BkC	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
[1]BlD:					
Berks part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]BMF:					
Berks part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Berks:					
Weikert part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Brinkerton:					
BrA, BrB	Severe: wetness	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.
Buchanan:					
BuB	Severe: wetness.	Moderate: wetness, frost action, shrink-swell.	Severe: wetness.	Moderate: slope, wetness, frost action.	Moderate: wetness, frost action.
BuC	Severe: wetness.	Moderate: slope, wetness, frost action.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness, frost action.
BxB	Severe: wetness, large stones.	Severe: large stones.	Severe: wetness large stones.	Severe: large stones.	Moderate: wetness, frost action, large stones.
BxD	Severe: wetness, large stones.	Severe: large stones.	Severe: wetness, large stones.	Severe: slope, large stones.	Moderate: slope, wetness, large stones.
Chavies:					
CaB	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Edom:					
EdB	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.
EdC	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.
EdD	Severe: slope, too clayey.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.
[1]EeB:					
Edom part	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.
Klinesville part	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock.
[1]EeC:					
Edom part	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.
Klinesville part	Moderate: slope, depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock.
[1]EeD:					
Edom part	Severe: slope, too clayey.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.
Klinesville part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Edom:					
[1]EfB:					
Edom part	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength, frost action.
Weikert part	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock.
[1]EfC:					
Edom part	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.
Weikert part	Moderate: slope, depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.
[1]EfD:					
Edom part	Severe: slope, too clayey.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.	Severe: slope, low strength.
Weikert part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Elliber:					
ElB	Slight	Moderate: frost action.	Slight	Moderate: slope, frost action.	Slight.
ElC	Slight	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
ElD, ElF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, frost action.
Ernest:					
ErB	Moderate: wetness.	Moderate: frost action.	Moderate: wetness.	Moderate: slope, frost action.	Moderate: frost action.
ErC	Moderate: slope, wetness.	Moderate: slope, frost action.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, frost action.
Evendale:					
Ev	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action.
Hagerstown:					
HaB, HcB	Moderate: depth to rock, too clayey.	Moderate: low strength, frost action, shrink-swell.	Moderate: depth to rock, low strength, shrink-swell.	Moderate: slope, low strength, frost action.	Severe: low strength, frost action.
HcC	Moderate: slope, depth to rock, too clayey.	Moderate: slope, low strength, frost action.	Moderate: slope, depth to rock, low strength.	Severe: slope.	Severe: low strength.
HcD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Hagerstown:					
[1]HeB:					
Hagerstown part	Moderate: depth to rock, too clayey.	Moderate: low strength, frost action, shrink-swell.	Moderate: depth to rock, low strength, shrink-swell.	Moderate: slope, low strength, frost action.	Severe: low strength.
Rock outcrop part.					
[1]HeD:					
Hagerstown part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Rock outcrop part.					
Hazleton:					
HhB	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Slight.
HhC	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.
HhD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]HSB:					
Hazleton part	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones, frost action.
Dekalb part	Severe: depth to rock, large stones.	Severe: large stones.	Severe: depth to rock, large stones.	Severe: large stones.	Moderate: depth to rock, large stones.
[1]HSD:					
Hazleton part	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Dekalb part	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.	Severe: slope.
[1]HTF:					
Hazleton part	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Dekalb part	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, large stones.	Severe: slope.
Klinesville:					
KlB	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock, frost action.
KlC	Moderate: slope, depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.
KlD, KlF	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Kreamer:					
KrB	Moderate: too clayey, wetness.	Severe: frost action.	Moderate: wetness.	Severe: frost action.	Severe: frost action.
KrC	Moderate: slope, too clayey, wetness.	Severe: frost action.	Moderate: slope, wetness.	Severe: slope, frost action.	Severe: frost action.
Laidig:					
LaB	Slight	Slight	Slight	Moderate: slope.	Slight.
LaC	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
LaD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
LcB	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones.
LcD, LDF	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Leetonia:					
LtB	Severe: cutbanks cave.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones.
Melvin:					
Ma	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness, frost action.
Mertz:					
MeB	Slight	Moderate: low strength, shrink-swell, frost action.	Moderate: low strength, shrink-swell.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
MeC	Moderate: slope.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
MeD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Millheim:					
MnB	Moderate: too clayey, depth to rock.	Moderate: shrink-swell, low strength, frost action.	Moderate: shrink-swell, low strength, depth to rock.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.
MnC	Moderate: slope, too clayey, depth to rock.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, depth to rock.	Severe: slope.	Severe: low strength.
Monongahela:					
MoA, MoB	Moderate: wetness.	Severe: frost action.	Moderate: wetness.	Severe: frost action.	Severe: frost action.
Morrison:					
MrB	Slight	Moderate: frost action.	Slight	Moderate: frost action.	Moderate: frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Morrison:					
MrC	Moderate: slope.	Moderate: frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
MrD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Murrill:					
MuB	Slight	Moderate: frost action.	Slight	Moderate: slope, frost action.	Moderate: low strength, frost action
MuC	Moderate: slope.	Moderate: frost action.	Moderate: slope	Severe: slope.	Moderate: slope, low strength, frost action.
Newark:					
Ne	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, frost action, wetness.
Nolin:					
No	Severe: floods.	Severe: floods, frost action.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
Opequon:					
OpB	Severe: depth to rock, too clayey.	Severe: depth to rock, low strength.	Severe: depth to rock, low strength.	Severe: depth to rock, low strength.	Severe: depth to rock, low strength.
OpC	Severe: depth to rock, too clayey.	Severe: depth to rock, low strength.	Severe: depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: depth to rock, low strength.
OpD	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.
[1]ORF:					
Opequon part	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.	Severe: slope, depth to rock, low strength.
Hagerstown part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Penlaw:					
Pe	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action.
Philo:					
Ph	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Pope:					
Po	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Purdy:					
Pu	Severe: wetness, too clayey.	Severe: wetness, frost action, low strength.	Severe: wetness, low strength.	Severe: wetness, frost action, low strength.	Severe: wetness, low strength, frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Rubble land:					
Ru	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Tyler:					
Ty	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness,	Severe: wetness, frost action.	Severe: frost action, low strength.
Vanderlip:					
VaC	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.
Watson:					
WaB	Moderate: wetness.	Moderate: frost action, shrink-swell.	Moderate: wetness.	Moderate: slope, frost action, shrink-swell.	Moderate: shrink-swell, frost action.
WaC	Moderate: slope, wetness.	Moderate: slope, frost action, shrink-swell.	Moderate: slope, wetness.	Severe: slope.	Moderate: slope, shrink-swell, frost action.
Weikert:					
WeB	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Moderate: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock, frost action.
WeC	Moderate: slope, depth rock.	Moderate: slope, depth to rock, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.
WeD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," and "fair," and other terms used to rate soils]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Allegheny:					
AbB	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Allenwood:					
AdB	Severe: percs slowly.	Moderate: slope, seepage, small stones.	Slight	Slight	Fair: thin layer.
AdC	Severe: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope, thin layer.
AdD	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Alvira:					
AlB	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness.	Severe: wetness.	Fair: too clayey, thin layer.
Andover:					
AnB	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
AoB	Severe: large stones, wetness, percs slowly.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones, wetness.
AoC	Severe: large stones, wetness, percs slowly.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones, wetness.
Ashton:					
As	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
Atkins:					
At	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, seepage.	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Poor: wetness.
Berks:					
BkB	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: small stones.
BkC	Severe: depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: small stones.
[1]BlD:					
Berks part	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
Weikert part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Berks:					
[1]BMF:					
Berks part	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
Weikert part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.
Brinkerton:					
BrA	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BrB	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Buchanan:					
BuB	Severe: wetness, percs slowly.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones, thin layer.
BuC	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, small stones, thin layer.
BxB	Severe: wetness, large stones, percs slowly.	Severe: large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
BxD	Severe: wetness, large stones, percs slowly.	Severe: slope, large stones.	Severe: wetness, large stones.	Severe: wetness.	Poor: large stones.
Chavies:					
CaB	Moderate: floods.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Edom:					
EdB	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
EdC	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey.
EdD	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
[1]EeB:					
Edom part	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Klinesville part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
[1]EeC:					
Edom part	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Edom:					
Klinesville part	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
[1]EeD:					
Edom part	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Klinesville part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.
[1]EfB:					
Edom part	Severe: percs slowly.	Moderate: slope, seepage.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Weikert part	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
[1]EfC:					
Edom part	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey.
Weikert part	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
[1]EfD:					
Edom part	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Weikert part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.
Elliber:					
ElB	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
ElC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
ElD	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope, small stones.
ElF	Severe: slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, small stones.
Ernest:					
ErB	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
ErC	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Evendale:					
Ev	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: small stones, too clayey.
Hagerstown:					
HaB, HcB	Moderate: depth to rock.	Moderate: slope, seepage, depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.
HcC	Moderate: slope, depth to rock.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: too clayey.
HcD	Severe: slope.	Severe: slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
[1]HeB:					
Hagerstown part	Moderate: depth to rock.	Moderate: slope, seepage, depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: too clayey.
Rock outcrop part.					
[1]HeD:					
Hagerstown part	Severe: slope.	Severe: slope.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Rock outcrop part.					
Hazleton:					
HhB	Moderate: depth to rock.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
HhC	Moderate: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
HhD	Severe: slope.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: slope seepage.	Poor: slope, small stones.
[1]HSB:					
Hazleton part	Severe: large stones.	Severe: seepage, large stones.	Severe: seepage, large stones, depth to rock.	Severe: seepage.	Poor: small stones, large stones.
Dekalb part	Severe: depth to rock, large stones.	Severe: depth to rock, seepage, large stones.	Severe: depth to rock, seepage, large stones.	Severe: seepage.	Poor: large stones, small stones.
[1]HSD:					
Hazleton part	Severe: slope, large stones.	Severe: slope, seepage, large stones.	Severe: seepage, large stones, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones, large stones.
Dekalb part	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, seepage, large stones.	Severe: slope, seepage.	Poor: slope, large stones, small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Hazleton:					
[1]HTF:					
Hazleton part	Severe: slope, large stones.	Severe: slope, seepage, large stones.	Severe: slope, large stones, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones, large stones.
Dekalb part	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope, seepage.	Poor: slope, large stones, small stones.
Klinesville:					
KlB	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
KlC	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
KlD	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.
KlF	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.
Kreamer:					
KrB	Severe: percs slowly, wetness.	Moderate: small stones.	Moderate: depth to rock, wetness, too clayey.	Severe: wetness.	Poor: too clayey.
KrC	Severe: percs slowly, wetness.	Severe: slope.	Moderate: slope, depth to rock, wetness.	Severe: wetness.	Poor: too clayey.
Laidig:					
LaB	Severe: percs slowly.	Moderate: slope, small stones.	Slight	Slight	Fair: small stones.
LaC	Severe: percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope, small stones.
LaD	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
LcB	Severe: percs slowly, large stones.	Severe: large stones.	Severe: large stones.	Slight	Poor: large stones.
LcD	Severe: slope, percs slowly, large stones.	Severe: slope, large stones.	Severe: large stones.	Severe: slope.	Poor: slope, large stones.
LDF	Severe: slope, percs slowly, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope, large stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Leetonia:					
LtB	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: small stones.
Melvin:					
Ma	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Mertz:					
MeB	Severe: percs slowly.	Moderate: slope, small stones.	Slight	Slight	Poor: small stones.
MeC	Severe: percs slowly.	Severe: slope.	Slight	Moderate: slope.	Poor: small stones.
MeD	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope, small stones.
Millheim:					
MnB	Moderate: depth to rock.	Moderate: slope, depth to rock, seepage.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
MnC	Moderate: slope, depth to rock.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: too clayey.
Monongahela:					
MoA	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Fair: thin layer.
MoB	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
Morrison:					
MrB	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
MrC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
MrD	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Murrill:					
MuB	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: small stones.
MuC	Moderate: slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, small stones.
Newark:					
Ne	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Nolin:					
No	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Opequon:					
OpB	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: thin layer, too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Opequon:					
OpC	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: slope.	Poor: thin layer, too clayey.
OpD	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer, too clayey.
[1]ORF:					
Opequon part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, thin layer, too clayey.
Hagerstown part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, too clayey.	Severe: slope.	Poor: slope, too clayey.
Penlaw:					
Pe	Severe: percs slowly, wetness.	Moderate: depth to rock.	Moderate: wetness.	Severe: wetness.	Fair: thin layer, too clayey.
Philo:					
Ph	Severe: floods, wetness.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Pope:					
Po	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Purdy:					
Pu	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Rubble land:					
Ru	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Poor: slope, large stones.
Tyler:					
Ty	Severe: percs slowly, wetness.	Slight	Moderate: wetness.	Severe: wetness.	Fair: too clayey.
Vanderlip:					
VaC	Moderate: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, too sandy.
Watson:					
WaB	Severe: wetness, percs slowly.	Moderate: slope, small stones.	Severe: wetness.	Severe: wetness.	Fair: small stones, thin layer
WaC	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer, small stones.
Weikert:					
WeB	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer small stones.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Weikert:					
WeC	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer, small stones.
WeD	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, small stones.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor."]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Allegheny:				
AbB	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Allenwood:				
AdB, AdC	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
AdD	Fair: slope, frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Alvira:				
AlB	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Andover:				
AnB	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, small stones, thin layer.
AoB	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, large stones, thin layer.
AoC	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, wetness, large stones.
Ashton:				
As	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Atkins:				
At	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Berks:				
BkB, BkC	Poor: thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: small stones.
[1]BlD:				
Berks part	Poor: thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, small stones.
Weikert part	Poor: thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, small stones.
[1]BMF:				
Berks part	Poor: thin layer.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, small stones.
Weikert part	Poor: slope.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, small stones.
Brinkerton:				
BrA, BrB	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Buchanan:				
BuB, BuC	Fair: wetness, frost action, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
BxB, BxD	Fair: wetness, large stones, frost action, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
Chavies:				
CaB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Edom:				
EdB	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
EdC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
EdD	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]EeB:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
Klinesville part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
[1]EeC:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
Klinesville part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
[1]EeD:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Klinesville part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer	Poor: slope, small stones.
[1]EfB:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
Weikert part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
[1]EfC:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
Weikert part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
[1]EfD:				
Edom part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Edom:				
Weikert part	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.
Elliber:				
ElB, ElC	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
ElD	Fair: slope, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
ElF	Poor: slope.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Ernest:				
ErB	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ErC	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Evendale:				
Ev	Poor: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
Hagerstown:				
HaB	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
HcB	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
HcC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
HcD	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
[1]HeB:				
Hagerstown part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
Rock outcrop part.				
[1]HeD:				
Hagerstown part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Rock outcrop part.				
Hazleton:				
HhB, HhC	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
HhD	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
[1]HSB:				
Hazleton part	Fair: frost action, large stones.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: large stones, small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hazleton:				
HSB:				
Dekalb part	Poor: thin layer.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: small stones, large stones, area reclaim.
[1]HSD:				
Hazleton part	Fair: slope, frost action, large stones.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: slope, large stones, small stones.
Dekalb part	Poor: thin layer.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: slope, large stones, area reclaim.
[1]HTF:				
Hazleton part	Poor: slope.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: slope, large stones, small stones.
Dekalb part	Poor: slope, thin layer.	Poor: excess fines, large stones.	Poor: excess fines, large stones.	Poor: slope, large stones, area reclaim.
Klinesville:				
KlB, KlC	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
KlD	Poor: thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.
KlF	Poor: slope, thin layer.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.
Kreamer:				
KrB, KrC	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
Laidig:				
LaB, LaC	Good	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
LaD	Fair: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
LcB	Fair: large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, small stones.
LcD	Fair: slope, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones, small stones.
LDF	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones, small stones.
Leetonia:				
LtB	Fair: large stones.	Fair: excess fines.	Fair: excess fines.	Poor: large stones, too sandy.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Melvin:				
Ma	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Mertz:				
MeB, MeC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
MeD	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Millheim:				
MnB	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MnC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Monongahela:				
MoA, MoB	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Morrison:				
MrB, MrC	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
MrD	Fair: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, small stones.
Murrill:				
MuB, MuC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
Newark:				
Ne	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Nolin:				
No	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Opequon:				
OpB, OpC	Poor: low strength.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: thin layer.
OpD	Poor: low strength.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, thin layer.
[1]ORF:				
Opequon part	Poor: slope, low strength.	Unsuited: excess fines, thin layer.	Unsuited: excess fines, thin layer.	Poor: slope, thin layer.
Hagerstown part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Penlaw:				
Pe	Poor: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Philo:				
Ph	Fair: low strength, frost action.	Poor: excess fines.	Poor: excess fines.	Good.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pope: Po	Fair: low strength, frost action.	Poor: excess fines.	Poor: excess fines.	Good.
Purdy: Pu	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Rubble land: Ru	Poor: slope, large stones.	Unsuited: large stones.	Unsuited: large stones.	Poor: slope, large stones.
Tyler: Ty	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Vanderlip: VaC	Good	Fair: excess fines.	Fair: excess fines.	Poor: too sandy.
Watson: WaB, WaC	Fair: frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones.
Weikert: WeB, WeC	Fair: frost action.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: small stones.
WeD	Fair: slope, frost action.	Unsuited: thin layer.	Unsuited: thin layer.	Poor: slope, small stones.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 11.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Allegheny:						
AbB	Slope, seepage.	Piping, low strength.	No water	Not needed	Slope, piping.	Slope.
Allenwood:						
AdB, AdC, AdD	Seepage, slope.	Low strength, compressible, piping.	No water	Not needed	Slope, piping.	Slope.
Alvira:						
AlB	Depth to rock, slope.	Low strength, compressible, piping.	Slow refill, depth to rock.	Percs slowly, wetness.	Percs slowly, wetness, piping.	Percs slowly, erodes easily, wetness.
Andover:						
AnB	Slope	Piping, low strength.	Favorable	Wetness, percs slowly.	Percs slowly, erodes easily, wetness.	Percs slowly, wetness, erodes easily.
AoB, AoC	Slope	Piping, low strength, large stones.	Large stones	Wetness, percs slowly.	Percs slowly, erodes easily, wetness, large stones.	Large stones, wetness, erodes easily.
Ashton:						
As	Slope, seepage.	Hard to pack, piping, low strength.	No water	Not needed	Erodes easily, slope, piping.	Erodes easily, slope.
Atkins:						
At	Seepage	Piping, floods, low strength.	Favorable	Floods, wetness.	Not needed	Wetness, floods.
Berks:						
BkB, BkC	Depth to rock, seepage.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock	Depth to rock, droughty.
[1]BlD:						
Berks part	Depth to rock, seepage.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock	Depth to rock, droughty.
Weikert part	Slope, seepage, depth to rock.	Thin layer, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]BMF:						
Berks part	Slope, depth to rock, seepage.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock	Depth to rock, droughty.
Weikert part	Slope, seepage, depth to rock.	Thin layer, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
Brinkerton:						
BrA, BrB	Slope	Piping, low strength.	Favorable	Wetness, percs slowly.	Percs slowly, erodes easily, wetness.	Percs slowly, wetness, erodes easily.
Buchanan:						
BuB, BuC	Slope	Piping, low strength.	Deep to water	Percs slowly, slope, wetness.	Slope, percs slowly.	Slope.
BxB, BxD	Slope	Large stones, piping, low strength.	Deep to water, large stones.	Percs slowly, slope, wetness.	Slope, large stones, percs slowly.	Slope, large stones.
Chavies:						
CaB	Slope, seepage.	Piping, low strength.	No water	Not needed	Slope, piping.	Slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Edom: EdB, EdC, EdD	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
[1]EeB: Edom part	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Klinesville part	Slope, seepage, depth to rock.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]EeC: Edom part	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Klinesville part	Slope, seepage, depth to rock.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]EeD: Edom part	Slope	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Klinesville part	Slope, seepage, depth to rock.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]EfB: Edom part	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Weikert part	Slope, seepage, depth to rock.	Thin layer, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]EfC: Edom part	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Weikert part	Slope, seepage, depth to rock.	Thin layer, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
[1]EfD: Edom part	Slope, seepage, depth to rock.	Low strength, compressible, hard to pack.	No water, depth to rock.	Not needed	Erodes easily, slope.	Erodes easily, slope.
Weikert part	Slope, seepage, depth to rock.	Thin layer, low strength, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
Elliber: ElB, ElC, ElD, ElF	Slope, seepage.	Piping, seepage.	No water	Not needed	Slope	Slope.
Ernest: ErB, ErC	Slope	Piping, low strength.	Deep to water, slow refill.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, erodes easily.
Evendale: Ev	Slope	Low strength, compressible, hard to pack.	Slow refill	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Hagerstown: HaB, HcB, HcC, HcD	Slope, seepage, depth to rock.	Compressible, hard to pack, low strength.	No water, depth to rock.	Not needed	Favorable	Favorable.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Hagerstown:						
[1]HeB:						
Hagerstown part	Slope, seepage, depth to rock.	Compressible, hard to pack, low strength.	No water, depth to rock.	Not needed	Favorable	Favorable.
Rock outcrop part.						
[1]HeD:						
Hagerstown part	Slope, seepage, depth to rock.	Compressible, hard to pack, low strength.	No water, depth to rock.	Not needed	Favorable	Favorable.
Rock outcrop part.						
Hazleton:						
HhB, HhC, HhD	Slope, depth to rock, seepage.	Low strength, piping.	No water, depth to rock.	Not needed	Slope	Slope.
[1]HSB:						
Hazleton part	Slope, depth to rock, seepage.	Low strength, piping, large stones.	No water, depth to rock, large stones.	Not needed	Slope, large stones.	Slope, large stones.
Dekalb part	Slope, depth to rock, seepage.	Piping, seepage, large stones.	No water, large stones, depth to rock.	Not needed	Depth to rock, large stones.	Droughty, rooting depth, large stones.
[1]HSD:						
Hazleton part	Slope, depth to rock, seepage.	Low strength, piping, large stones.	No water, large stones, depth to rock.	Not needed	Slope, large stones.	Slope, large stones.
Dekalb part	Slope, depth to rock, seepage.	Piping, seepage, large stones.	No water, large stones, depth to rock.	Not needed	Depth to rock, large stones.	Droughty, rooting depth, large stones.
[1]HTF:						
Hazleton part	Slope, depth to rock, seepage.	Low strength, piping, large stones.	No water, large stones, depth to rock.	Not needed	Slope, large stones.	Slope, large stones.
Dekalb part	Slope, depth to rock, seepage.	Piping, seepage, large stones.	No water, large stones, depth to rock.	Not needed	Depth to rock, large stones.	Droughty, rooting depth, large stones.
Klinesville:						
KlB, KlC, KlD, KlF	Slope, seepage, depth to rock.	Seepage, thin layer.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
Kreamer:						
KrB, KrC	Slope	Low strength	Deep to water, slow refill.	Percs slowly, wetness.	Slope, percs slowly.	Slope, percs slowly.
Laidig:						
LaB, LaC, LaD	Slope, seepage.	Low strength	Deep to water	Not needed	Slope	Slope.
LcB, LcD, LDF	Slope, seepage.	Large stones, low strength.	Deep to water, large stones.	Not needed	Large stones, slope.	Large stones, slope.
Leetonia:						
LtB	Slope, depth to rock, seepage.	Seepage, piping, large stones.	No water	Not needed	Depth to rock, large stones, piping.	Droughty, large stones, slope.
Melvin:						
Ma	Seepage	Low strength, piping.	Favorable	Wetness, floods.	Not needed	Wetness.
Mertz:						
MeB, MeC, MeD	Slope, depth to rock.	Piping, low strength.	No water	Not needed	Erodes easily, slope, piping.	Erodes easily, slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Millheim:						
MnB, MnC----------	Slope, depth to rock, seepage.	Low strength, hard to pack, compressible.	No water, depth to rock.	Not needed-----	Depth to rock, slope.	Slope, erodes easily.
Monongahela:						
MoA, MoB----------	Slope-----------	Low strength, compressible.	Deep to water, slow refill.	Percs slowly, slope, wetness.	Percs slowly, piping.	Percs slowly, erodes easily, slope.
Morrison:						
MrB, MrC, MrD-----	Slope, seepage.	Piping, seepage.	No water--------	Not needed-----	Slope, erodes easily.	Slope, erodes easily.
Murrill:						
MuB, MuC----------	Slope, seepage.	Piping, low strength, hard to pack.	No water--------	Not needed-----	Slope, erodes easily.	Slope, erodes easily.
Newark:						
Ne----------------	Seepage---------	Low strength, compressible.	Slow refill----	Wetness, floods, poor outlets.	Not needed-----	Wetness.
Nolin:						
No----------------	Seepage, depth to rock.	Low strength, compressible.	Deep to water	Not needed-----	Not needed-----	Not needed.
Opequon:						
OpB, OpC, OpD-----	Slope, depth to rock, seepage.	Thin layer, compressible, hard to pack.	No water, depth to rock.	Not needed-----	Depth to rock, erodes easily, slope.	Slope, rooting depth, depth to rock.
[1]ORF:						
Opequon part----	Slope, depth to rock, seepage.	Thin layer, compressible, hard to pack.	No water, depth to rock.	Not needed-----	Depth to rock, erodes easily, slope.	Slope, rooting depth, depth to rock.
Hagerstown part	Slope, seepage, depth to rock.	Compressible, hard to pack, low strength.	No water, depth to rock.	Not needed-----	Favorable------	Favorable.
Penlaw:						
Pe----------------	Slope, depth to rock.	Low strength, compressible.	Slow refill, depth to rock.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness, erodes easily.
Philo:						
Ph----------------	Seepage---------	Piping, low strength, hard to pack.	Deep to water, slow refill.	Floods, poor outlets.	Not needed-----	Not needed.
Pope:						
Po----------------	Seepage---------	Piping----------	No water--------	Not needed-----	Not needed-----	Not needed.
Purdy:						
Pu----------------	Slope-----------	Low strength, compressible, hard to pack.	Slow refill----	Percs slowly, wetness.	Wetness---------	Wetness.
Rubble land:						
Ru----------------	Slope-----------	Large stones, piping, seepage.	Large stones, no water.	Large stones---	Large stones, piping.	Large stones, slope.
Tyler:						
Ty----------------	Favorable-------	Low strength, compressible.	Favorable------	Percs slowly, wetness.	Wetness, percs slowly, piping.	Wetness, percs slowly.
Vanderlip:						
VaC---------------	Slope, seepage, depth to rock.	Piping, seepage.	No water--------	Not needed-----	Piping, slope.	Droughty, slope.
Watson:						
WaB, WaC----------	Slope-----------	Piping, low strength.	Deep to water, slow refill.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Weikert:						
WeB, WeC, WeD	Slope, seepage, depth to rock.	Thin layer, seepage.	No water, depth to rock.	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe"]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Allegheny:				
AbB	Slight	Slight	Moderate: slope.	Slight.
Allenwood:				
AdB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
AdC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
AdD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
Alvira:				
AlB	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Andover:				
AnB	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
AoB	Severe: large stones, wetness.	Severe: wetness, large stones.	Severe: large stones, wetness.	Severe: wetness, large stones.
AoC	Severe: wetness, large stones.	Severe: wetness, large stones.	Severe: slope, large stones, wetness.	Severe: wetness, large stones.
Ashton:				
As	Moderate: floods.	Slight	Slight	Slight.
Atkins:				
At	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.
Berks:				
BkB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
BkC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
[1]BlD:				
Berks part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
Weikert part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
[1]BMF:				
Berks part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Weikert part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Brinkerton:				
BrA, BrB	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Buchanan:				
BuB	Moderate: wetness, small stones.	Moderate: wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness, small stones.
BuC	Moderate: slope, wetness, small stones.	Moderate: slope, wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness, small stones.
BxB	Severe: large stones, slope.	Moderate: wetness, large stones.	Severe: large stones, wetness.	Severe: large stones.
BxD	Severe: large stones, slope	Moderate: slope, wetness, large stones.	Severe: slope, large stones, wetness.	Severe: large stones.
Chavies:				
CaB	Slight	Slight	Moderate: slope.	Slight.
Edom:				
EdB	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
EdC	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
EdD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
[1]EeB:				
Edom part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Klinesville part	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.
[1]EeC:				
Edom part	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Klinesville part	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.
[1]EeD:				
Edom part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Klinesville part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
[1]EfB:				
Edom part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Edom:				
Weikert part	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.
[1]EfC:				
Edom part	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Weikert part	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.
[1]EfD:				
Edom part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Weikert part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.
Elliber:				
ElB	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
ElC	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
ElD	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.
ElF	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Ernest:				
ErB	Moderate: percs slowly, wetness.	Slight	Moderate: slope, percs slowly, wetness.	Slight.
ErC	Moderate: slope, percs slowly, wetness.	Moderate: slope.	Severe: slope.	Slight.
Evendale:				
Ev	Severe: wetness, small stones.	Moderate: small stones, wetness.	Severe: wetness, small stones.	Moderate: small stones, wetness.
Hagerstown:				
HaB	Slight	Slight	Moderate: slope.	Slight.
HcB	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
HcC	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
HcD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Hagerstown:				
[1]HeB:				
Hagerstown part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Rock outcrop part.				
[1]HeD:				
Hagerstown part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Rock outcrop part.				
Hazleton:				
HhB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
HhC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
HhD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
[1]HSB:				
Hazleton part	Severe: large stones.	Moderate: large stones, small stones.	Severe: small stones, large stones.	Severe: large stones.
Dekalb part	Severe: large stones.	Moderate: small stones, large stones.	Severe: small stones, large stones.	Severe: large stones.
[1]HSD:				
Hazleton part	Severe: slope, large stones.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: large stones.
Dekalb part	Severe: slope, large stones.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: large stones.
[1]HTF:				
Hazleton part	Severe: slope, large stones.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope, large stones.
Dekalb part	Severe: slope, large stones.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope, large stones.
Klinesville:				
KlB	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.
KlC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.
KlD	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Klinesville:				
KlF	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Kreamer:				
KrB	Moderate: small stones, percs slowly, wetness.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
KrC	Moderate: slope, percs slowly, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
Laidig:				
LaB	Moderate: small stones, percs slowly.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
LaC	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
LaD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
LcB	Severe: large stones.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones.
LcD	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones, small stones.	Severe: large stones.
LDF	Severe: slope, large stones.	Severe: slope.	Severe: slope, large stones, small stones.	Severe: slope, large stones.
Leetonia:				
LtB	Severe: large stones.	Moderate: large stones.	Severe: slope.	Severe: large stones.
Melvin:				
Ma	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.
Mertz:				
MeB	Moderate: percs slowly, small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
MeC	Moderate: slope, percs slowly, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
MeD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, small stones.
Millheim:				
MnB	Slight	Slight	Moderate: slope.	Slight.
MnC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Monongahela:				
MoA	Moderate: wetness, percs slowly.	Slight	Moderate: wetness.	Slight.
MoB	Moderate: wetness, percs slowly.	Slight	Moderate: slope, wetness.	Slight.
Morrison:				
MrB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
MrC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
MrD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: small stones.
Murrill:				
MuB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
MuC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: small stones.
Newark:				
Ne	Severe: floods, wetness.	Moderate: wetness.	Severe: floods, wetness.	Moderate: wetness.
Nolin:				
No	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Opequon:				
OpB	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.
OpC	Moderate: slope, percs slowly.	Moderate: slope, too clayey.	Severe: slope, depth to rock.	Moderate: too clayey.
OpD	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, too clayey.
[1]ORF:				
Opequon part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Hagerstown part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Penlaw:				
Pe	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Philo:				
Ph	Moderate: floods.	Moderate: floods.	Moderate: floods, wetness.	Slight.
Pope:				
Po	Moderate: floods.	Moderate: floods.	Moderate: floods.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Purdy:				
Pu	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Rubble land:				
Ru	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Tyler:				
Ty	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Vanderlip:				
VaC	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.
Watson:				
WaB	Moderate: percs slowly, wetness, small stones.	Moderate: small stones.	Moderate: slope, small stones, wetness.	Moderate: small stones.
WaC	Moderate: slope, percs slowly, wetness.	Moderate: slope, small stones.	Severe: slope.	Moderate: small stones.
Weikert:				
WeB	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.
WeC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.
WeD	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Allegheny:										
AbB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Allenwood:										
AdB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AdC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AdD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Alvira:										
AlB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Andover:										
AnB	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
AoB	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
AoC	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Ashton:										
As	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Atkins:										
At	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Berks:										
BkB	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
BkC	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
[1]BlD:										
Berks part	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Weikert part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]BMF:										
Berks part	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Weikert part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Brinkerton:										
BrA	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
BrB	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor
Buchanan:										
BuB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Buchanan:										
BuC	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
BxB	Very poor.	Very poor.	Good	Good	Good	Fair	Very poor.	Poor	Fair	Poor.
BxD	Very poor.	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Fair	Very poor.
Chavies:										
CaB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Edom:										
EdB	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
EdC	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
EdD	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]EeB:										
Edom part	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Klinesville part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]EeC:										
Edom part	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Klinesville part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]EeD:										
Edom part	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Klinesville part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]EfB:										
Edom part	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Weikert part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]EfC:										
Edom part	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Weikert part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
[1]EfD:										
Edom part	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Weikert part	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Elliber:										
ElB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ElD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ElF	Very poor	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Ernest:										
ErB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ErC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Evendale:										
Ev	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hagerstown:										
HaB, HcB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HcC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HcD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]HeB:										
Hagerstown part	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Rock outcrop part.										
[1]HeD:										
Hagerstown part	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop part.										
Hazleton:										
HhB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HhC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HhD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
[1]HSB:										
Hazleton part	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Dekalb part	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
[1]HSD:										
Hazleton part	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb part	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Hazleton:										
[1]HTF:										
Hazleton part	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Dekalb part.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Klinesville:										
KlB, KlC, KlD, KlF	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Kreamer:										
KrB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KrC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Laidig:										
LaB	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
LaC	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
LaD	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LcB	Very poor.	Very poor.	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
LcD	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
LDF	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Leetonia:										
LtB	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Melvin:										
Ma	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mertz:										
MeB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MeC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MeD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Millheim:										
MnB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Monongahela:										
MoA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MoB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Morrison:										
MrB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Morrison:										
MrC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MrD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Murrill:										
MuB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MuC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Newark:										
Ne	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Nolin:										
No	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Opequon:										
OpB, OpC, OpD	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
[1]ORF:										
Opequon part	Very poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Hagerstown part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Penlaw:										
Pe	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair.
Philo:										
Ph	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Pope:										
Po	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Purdy:										
Pu	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Rubble land:										
Ru	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Tyler:										
Ty	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Vanderlip:										
VaC	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Watson:										
WaB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WaC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Weikert:										
WeB, WeC, WeD	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristic of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Allegheny:											
AbB	0-9	Loam	ML, CL, CL-ML	A-4	0	90-100	75-100	65-100	50-90	<35	NP-10
	9-40	Clay loam, sandy clay loam, silt loam.	ML, CL, SM, SC	A-4	0	90-100	75-100	65-95	45-80	<35	NP
	40-67	Sandy loam, gravelly sandy loam, gravelly sandy clay loam.	SM, SC, ML, GM	A-4, A-6, A-2	0-5	65-100	50-100	30-95	15-75	<35	NP-15
Allenwood:											
AdB, AdC, AdD	0-8	Gravelly silt loam.	ML, CL, GM, SM	A-4, A-6, A-7	0-10	70-85	70-85	50-85	40-80	---	---
	8-41	Loam, silty clay loam, gravelly silt loam.	CL, GM, GC, MH	A-4, A-5, A-6, A-7	0-15	60-95	45-90	45-90	35-75	25-57	5-23
	41-60	Gravelly clay loam, gravelly silty clay loam.	CL, SM, GM, MH	A-1, A-2, A-4, A-7	0-20	40-100	40-80	20-80	15-75	5-55	NP-23
Alvira:											
AlB	0-10	Silt loam	ML	A-4, A-6	0-5	90-100	80-95	70-90	50-80	---	---
	10-25	Silt loam, silty clay loam.	CL, GC, CL-ML, SC	A-4, A-6	0-10	65-100	55-90	50-90	35-85	25-40	5-15
	25-60	Gravelly silt loam, silty clay loam.	CL, GC, CL-ML, SC	A-4, A-6, A-2	0-20	65-95	45-90	40-90	30-85	25-40	5-15
Andover:											
AnB	0-6	Gravelly loam	SM, SC, ML, CL	A-4, A-2	0-5	65-75	65-75	60-70	30-60	---	---
	6-18	Loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2	0-25	80-95	65-85	60-85	30-60	20-35	4-10
	18-50	Loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-2, A-4	0-25	80-95	65-85	60-85	30-60	20-35	2-10
	50-60	Gravelly sandy clay loam, gravelly loam, gravelly sandy loam.	SM, GC, ML, CL	A-2, A-4	5-30	70-85	55-80	50-75	25-60	20-35	2-10
AoB, AoC	0-6	Extremely stony loam.	ML, CL, SM, SC	A-4, A-2	5-15	70-100	65-95	60-90	30-85	---	---
	6-18	Loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2	0-25	80-95	65-85	60-80	30-60	20-35	4-10
	18-50	Loam, gravelly clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2	0-25	80-95	65-85	60-85	30-60	20-35	2-9
	50-60	Gravelly sandy clay loam, gravelly loam, gravelly sandy loam.	SM, GC, ML, CL	A-2, A-4	5-30	70-85	55-80	50-75	25-60	20-35	2-9

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ashton:											
As-----------------	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	9-43	Silt loam, silty clay loam.	CL, ML-CL	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-20
	43-60	Silt loam, loam, fine sandy loam.	ML, CL, SM, SC	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
Atkins:											
At-----------------	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	70-100	70-100	65-100	60-95	25-50	2-25
	8-40	Silty clay loam, silt, loam.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6, A-7	0-5	75-100	70-100	50-100	25-85	20-50	1-25
	40-66	Silty clay loam, silt loam, loam.	SM, SC, GM, ML	A-2, A-4, A-6	0-5	70-100	70-100	50-95	15-85	20-45	1-15
Berks:											
BkB, BkC-----------	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	5-27	Shaly loam, very shaly silt loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	27-32	Very shaly loam, very shaly silt loam.	GM, GC, SM, SC	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]BlD:											
Berks part-------	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	5-27	Shaly loam, very shaly silt loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	27-32	Very shaly loam, very shaly silt loam.	GM, GC, SM, SC	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert part-----	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam.	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]BMF:											
Berks part-------	0-5	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	5-27	Shaly loam, very shaly silt loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	27-32	Very shaly loam, very shaly silt loam.	GM, GC, SM, SC	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	32	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Berks:											
Weikert part	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam.	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Brinkerton:											
BrA, BrB	0-7	Silt loam	ML, CL	A-4, A-6, A-7	0-10	90-100	85-100	85-100	75-100	---	---
	7-16	Silty clay loam, silt loam.	ML, CL-ML	A-4, A-6, A-7	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	16-45	Silt loam, silty clay loam, loam.	ML, CL-ML	A-4, A-6, A-7	0-10	75-100	75-100	65-100	55-100	30-45	5-15
	45-65	Silt loam, shaly loam, silty clay loam.	ML, SC, SM, CL	A-4, A-6, A-2	0-15	70-90	35-85	30-85	25-75	30-40	5-15
Buchanan:											
BuB, BuC	0-10	Gravelly loam	GM, ML, CL, SM	A-4, A-2	0-20	50-100	45-95	40-75	30-65	---	---
	10-21	Gravelly loam, gravelly silt loam, gravelly clay loam.	GM, ML, CL, SC	A-4, A-2, A-6 A-1	0-20	50-100	45-95	40-90	20-80	20-35	NP-11
	21-60	Gravelly loam, gravelly sandy clay loam.	GM, ML, CL, SC	A-4, A-2, A-6, A-1	0-20	50-100	45-90	30-75	20-60	18-35	NP-12
BxB, BxD	0-10	Extremely stony loam.	GM, ML, CL, SM	A-2, A-4	5-20	50-85	45-70	40-70	30-60	---	---
	10-21	Gravelly loam, gravelly silt loam, gravelly sandy clay loam.	GM, ML, CL, SC	A-2, A-4, A-6, A-1	0-20	50-100	45-95	40-90	20-80	20-35	NP-11
	21-60	Gravelly loam, gravelly sandy clay loam.	GM, ML, CL, SC	A-2, A-4, A-6, A-1	0-20	50-100	45-90	30-75	20-60	18-35	NP-12
Chavies:											
CaB	0-10	Loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	90-100	85-100	40-95	25-75	<25	NP-5
	10-40	Fine sandy loam, loam.	SM, ML, CL, SC	A-4, A-2	0	90-100	85-100	45-100	25-85	<35	NP-8
	40-76	Fine sandy loam, gravelly fine sandy loam, silt loam.	SM, ML, CL, SC	A-4, A-1, A-2	0-5	70-100	60-95	40-85	20-75	<25	NP-5
Edom:											
EdB, EdC, EdD	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2, A-4	5-20	25-80	20-70	15-60	15-55	35-49	0-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Edom:											
[1]EeB:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2, A-4	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Klinesville part	0-6	Shaly silt loam	GM, SM	A-2, A-1, A-4	0-10	25-85	15-60	10-50	6-40	---	---
	6-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	15-55	10-50	4-40	20-35	NP-9
	12-19	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1	0-20	15-60	10-50	10-40	4-30	20-35	NP-7
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]EeC:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2, A-4	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Klinesville part	0-6	Shaly silt loam	GM, SM	A-2, A-1, A-4	0-10	25-85	20-75	10-50	6-40	---	---
	6-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	20-75	10-50	4-40	20-35	NP-9
	12-19	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1	0-20	15-60	10-50	10-40	4-30	20-35	NP-7
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]EeD:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2, A-4	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Klinesville part	0-6	Shaly silt loam	GM, SM	A-2, A-1, A-4	0-10	25-85	20-75	10-50	6-40	---	---
	6-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	20-75	10-50	4-40	20-35	NP-9
	12-19	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1	0-20	15-60	10-50	10-40	4-30	20-35	NP-7
	19	Bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Edom:											
[1]EfB:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert part-----	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]EfC:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert part-----	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam.	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]EfD:											
Edom part--------	0-8	Silty clay loam	ML, CL	A-7, A-6	0	85-100	80-100	75-95	70-90	---	---
	8-36	Silty clay, clay, shaly clay.	CH, CL, CL-ML	A-7, A-6	0-10	70-95	65-95	65-95	55-90	35-55	12-30
	36-46	Shaly silty clay loam, very shaly silty clay, shaly clay.	GM, ML, SM, CL-ML	A-7, A-6, A-2	5-20	25-80	20-70	15-60	15-55	35-49	10-20
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert part-----	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam.	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Elliber:											
ElB, ElC, ElD, ElF	0-15	Very cherty loam	GM, SM, GW-GM, SW-SM	A-2, A-1, A-4	5-15	30-60	25-45	15-45	10-40	---	---
	15-71	Very cherty silt loam, very cherty loam.	GM, SM, GW-GM, SW-SM	A-2, A-1, A-4	20-40	40-65	30-60	25-50	5-40	20-35	NP-7
Ernest:											
ErB, ErC----------	0-10	Silt loam--------	ML, CL	A-4, A-6	0-15	75-100	70-100	70-95	60-95	25-40	2-15
	10-24	Silt loam, silty clay loam.	ML, CL	A-4, A-5, A-6, A-7	0-15	75-100	75-100	70-95	65-95	25-50	2-25
	24-40	Silty clay loam, silt loam.	GM, SM, ML, CL	A-4, A-5, A-6 A-7	5-20	70-95	55-95	50-95	40-95	25-50	2-25
	40-60	Silty clay loam, silty clay.	GM, SM, ML, CL	A-4, A-5, A-6 A-7	5-20	70-95	55-95	50-95	40-95	25-50	2-25
Evendale:											
Ev----------------	0-7	Cherty silt loam	ML, CL, GM	A-4, A-6	0-10	60-95	50-85	45-85	35-80	---	---
	7-60	Silty clay loam, clay, cherty silty clay.	ML, MH, CL, CH	A-6, A-7	0-20	70-95	60-85	60-85	55-80	35-55	15-25
Hagerstown:											
HaB---------------	0-14	Silt loam--------	CL, CL-ML	A-4, A-5, A-6 A-7	0-15	95-100	90-100	80-100	70-95	25-50	5-25
	14-40	Clay, silty clay, silty clay loam.	CH	A-7	0-5	90-100	80-100	75-100	55-95	51-63	26-34
	40-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
HcB, HcC, HcD-----	0-14	Silty clay loam	CL, CL-ML	A-4, A-5, A-6, A-7	0-15	95-100	90-100	80-100	70-95	25-50	5-25
	14-40	Clay, silty clay, silty clay loam.	CH	A-7	0-5	90-100	80-100	75-100	55-95	51-63	26-34
	40-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
[1]HeB:											
Hagerstown part-	0-14	Silty clay loam	CL, CL-ML	A-4, A-5, A-6, A-7	0-15	95-100	90-100	80-100	70-95	25-50	5-25
	14-40	Clay, silty clay, silty clay loam.	CH	A-7	0-5	90-100	80-100	75-100	55-95	51-63	26-34
	40-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
Rock outcrop part.											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Hagerstown:											
[1]HeD:											
Hagerstown part	0-14	Silty clay loam	CL, CL-ML	A-4, A-5, A-6, A-7	0-15	95-100	90-100	80-100	70-95	25-50	5-25
	14-40	Clay, silty clay, silty clay loam.	CH	A-7	0-5	90-100	80-100	75-100	55-95	51-63	26-34
	40-60	Clay, silty clay, silty clay loam.	CH, CL, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
Rock outcrop part.											
Hazleton:											
HhB, HhC, HhD	0-6	Channery loam, channery sandy loam.	ML, GM, SM	A-2, A-4	5-25	60-85	30-80	25-70	25-55	---	---
	6-36	Channery sandy loam, loam, very channery sandy loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-25	60-85	30-80	25-70	20-55	<30	NP-8
	36-60	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-35	55-80	30-75	25-65	15-50	<30	NP-8
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]HSB:											
Hazleton part	0-6	Extremely stony sandy loam.	GM, SM, ML	A-4, A-2	5-25	60-100	30-100	25-90	25-75	---	---
	6-36	Channery sandy loam, very channery sandy loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-25	60-85	30-80	25-70	20-55	<30	NP-8
	36-60	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-35	55-80	30-75	25-65	15-50	<30	NP-8
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dekalb part	0-9	Extremely stony sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-7
	9-25	Channery sandy loam, channery loam, very channery loamy sand.	SM, GM, ML, CL-ML	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-7
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]HSD:											
Hazleton part	0-6	Extremely stony sandy loam.	GM, SM, ML	A-4, A-2	5-25	60-100	30-100	25-90	25-75	---	---
	6-36	Channery sandy loam, very channery sandy loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-25	60-85	30-80	25-70	20-55	<30	NP-8
	36-60	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-35	55-80	30-75	25-65	15-50	<30	NP-8
	56	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hazleton:											
Dekalb part	0-9	Extremely stony sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-7
	9-25	Channery sandy loam, channery loam, very channery loamy sand.	SM, GM, ML, CL-ML	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-7
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]HTF:											
Hazleton part	0-6	Extremely stony sandy loam.	GM, SM, ML	A-4, A-2	5-25	60-100	30-100	25-90	25-75	---	---
	6-36	Channery sandy loam, very channnery sandy loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-25	60-85	30-80	25-70	20-55	<30	NP-8
	36-60	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-35	55-80	30-75	25-65	15-50	<30	NP-8
	56	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dekalb part	0-9	Extremely stony sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	10-32	NP-7
	9-25	Channery sandy loam, channery loam, very channery loamy sand.	SM, GM, ML, CL-ML	A-2, A-4, A-1	5-40	50-85	40-75	40-75	20-55	15-32	NP-7
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Klinesville:											
KlB, KlC, KlD, KlF	0-6	Shaly silt loam	GM, SM	A-2, A-1, A-4	0-10	25-85	20-75	10-50	6-40	---	---
	6-12	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1, A-4	0-10	25-75	20-75	10-50	4-40	20-35	NP-9
	12-19	Shaly silt loam, very shaly silt loam.	GM, GP, SM, SP	A-2, A-1	0-20	15-60	10-50	10-40	4-30	20-35	NP-7
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kreamer:											
KrB, KrC	0-8	Cherty silt loam	ML, GM, GW-GM, CL-ML	A-4, A-6	0-15	65-95	45-95	40-75	35-70	---	---
	8-20	Cherty silty clay loam, cherty clay loam, clay.	ML, GM, SM	A-7, A-5, A-6, A-4	0-15	60-95	45-95	40-90	35-85	35-49	9-20
	20-67	Cherty silty clay, cherty silty clay loam, clay.	CL, GC, SC	A-6, A-5, A-4, A-7	0-15	60-95	45-90	40-90	35-85	25-45	7-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Laidig:											
LaB, LaC, LaD-----	0-10	Channery loam---	GM, SM, ML, CL	A-4, A-6	0-5	65-90	55-80	50-80	35-70	25-40	NP-15
	10-30	Channery loam, channery sandy clay loam, channery sandy loam.	SC, GC, GM-GC, SM-SC	A-1, A-2, A-4, A-6	5-10	70-95	60-85	40-75	20-45	15-35	NP-20
	30-65	Channery sandy clay loam, channery loam, channery sandy loam.	GC, SC	A-1, A-2, A-4, A-6	5-25	50-85	35-80	30-70	15-40	10-35	5-20
LcB, LcD, LDF-----	0-10	Extremely stony loam.	GM, SM, ML	A-1, A-2, A-4	10-30	65-90	55-80	35-75	15-60	15-30	NP-5
	10-30	Channery loam, channery sandy clay loam, channery sandy loam.	SC, GC, GM-GC, SM-SC	A-1, A-2, A-4, A-6	5-10	70-95	60-85	40-75	20-45	15-35	NP-20
	30-65	Channery sandy clay loam, channery loam, channery sandy loam.	GC, SC	A-1, A-2, A-4, A-6	5-25	50-85	35-80	30-70	15-40	10-35	5-20
Leetonia:											
LtB---------------	0-6	Extremely stony loamy sand.	GW, GM, SW, SM	A-1, A-2, A-3	25-50	45-85	35-70	20-55	2-20	---	NP
	6-17	Gravelly loamy sand, very gravelly loamy sand, very gravelly sand.	GW, GM, SW, SM	A-1, A-2, A-3	25-50	45-85	35-70	20-55	2-20	---	NP
	17-48	Very gravelly sand, very gravelly loamy sand, gravelly loamy sand.	GW, GM, SW, SM	A-1, A-2, A-3	25-40	45-75	35-70	20-35	2-15	---	NP
	48	Unweathered bedrock.	GW, GM, SW, SM	---	---	---	---	---	---	---	---
Melvin:											
Ma----------------	0-9	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	65-95	25-40	5-20
	9-60	Silt loam, silty clay loam, gravelly silt loam.	ML, CL, CL-ML	A-4, A-6	0	85-100	70-100	65-100	60-95	25-40	5-20
Mertz:											
MeB, MeC, MeD-----	0-9	Cherty silt loam	ML, GM, SM	A-4, A-6	5-20	60-95	45-85	40-85	35-75	---	---
	9-47	Cherty silty clay loam, cherty silt loam, cherty loam.	CL, GC, SC, CL-ML	A-6, A-7, A-4, A-2	5-30	55-95	25-85	25-85	20-75	30-45	7-20
	47-63	Cherty clay loam, very cherty clay loam, very cherty silty clay loam.	CL, GC, SC	A-6, A-7, A-2, A-4	5-30	55-80	25-85	25-70	20-55	30-45	10-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Millheim:											
MnB, MnC	0-6	Silt loam	ML	A-4, A-6	0	85-100	70-100	70-100	60-90	---	---
	6-36	Silty clay loam, shaly silty clay, shaly silty clay loam.	ML, CH, CL, SC	A-7, A-6, A-5, A-4	0	70-100	50-100	50-90	45-85	30-55	9-25
	36-42	Very shaly silty clay, very shaly silty clay loam, shaly silty clay loam.	ML, CL, SC, CH	A-7, A-6, A-4, A-2	0-10	55-90	30-90	30-90	25-85	30-55	9-25
	42	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Monongahela:											
MoA, MoB	0-10	Silt loam	ML, SM, CL, SC	A-4, A-6, A-7	0-5	90-100	85-100	75-100	45-90	20-45	1-12
	10-28	Loam, silt loam, clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-10	90-100	90-100	80-100	70-90	25-50	2-25
	28-56	Loam, silt loam, clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	0-10	80-100	75-100	70-95	45-95	20-50	1-25
	56-70	Stratified sandy loam to clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-7	5-20	75-100	60-100	60-95	40-95	20-50	1-25
Morrison:											
MrB, MrC, MrD	0-9	Gravelly sandy loam.	SM, ML	A-2, A-4	0-10	80-100	70-95	50-65	25-55	---	---
	9-50	Gravelly sandy loam, gravelly sandy clay loam.	SM, ML	A-2, A-4	0-20	80-100	60-100	55-80	25-55	<35	NP-10
	50-72	Gravelly sandy loam.	SM, SC, SM-SC	A-2, A-3, A-4	0-20	80-100	60-100	55-90	10-45	<25	NP-10
Murrill:											
MuB, MuC	0-14	Gravelly loam	ML, SM, GM, CL	A-4, A-6, A-2	0-5	60-90	55-85	45-75	30-65	30-40	5-15
	14-31	Gravelly silty clay loam, gravelly sandy clay loam, loam.	ML, CL, MH, CH	A-4, A-6, A-7, A-5	0-15	65-90	60-85	55-75	55-65	30-70	5-40
	31-80	Gravelly sandy clay loam, sandy clay loam.	CH, GC, CL, SC	A-6, A-7	0	85-100	55-100	50-100	45-100	35-75	30-45
Newark:											
Ne	0-8	Silt loam	ML, CL	A-4	0	95-100	90-100	80-100	55-95	<35	NP-10
	8-50	Silt loam, silty clay loam, gravelly sandy loam.	CL, CL-ML	A-4, A-6	0	95-100	75-100	70-100	70-95	25-40	5-20
	50-60	Gravelly sandy loam.	CL, GM, CL-ML	A-4, A-6	0-10	75-100	65-100	60-100	55-95	25-40	5-20
Nolin:											
No	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-20
	10-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	75-100	25-40	5-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Opequon:											
OpB, OpC, OpD-----	0-8	Silty clay loam	CL, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	35-70	15-40
	8-16	Silty clay, clay, silty clay loam.	CH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-90	20-50
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]ORF:											
Opequon part----	0-8	Silty clay loam	CL, CH	A-6, A-7	0-5	85-100	80-100	80-100	75-95	35-70	15-40
	8-16	Silty clay, clay, silty clay loam.	CH, CL	A-6, A-7	0-10	80-100	60-100	60-100	55-95	35-90	20-50
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hagerstown part-	0-14	Silty clay loam	CL, CL-ML	A-4, A-5, A-6, A-7	0-15	95-100	90-100	80-100	70-95	25-50	5-25
	14-40	Clay, silty clay, silty clay loam.	CH	A-7	0-5	90-100	80-100	75-100	55-95	51-63	26-34
	40-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
Penlaw:											
Pe----------------	0-11	Silt loam-------	CL, CL-ML	A-4, A-6	0-10	95-100	85-100	75-100	60-100	10-40	5-25
	11-30	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0-10	95-100	85-100	75-100	60-95	10-40	5-25
	30-45	Silty clay loam, silt loam.	CL, CH, CL-ML	A-4, A-6, A-1, A-5	0-20	65-100	60-100	55-100	50-95	15-55	6-30
	45-69	Silty clay.	CL, MH, GC, SC	A-4, A-6, A-7, A-5	0-20	65-100	60-100	55-100	40-95	15-55	6-30
Philo:											
Ph----------------	0-42	Silt loam, loam	ML, CL, SM, SC	A-4	0	95-100	80-100	70-90	45-80	20-40	1-10
	42-60	Stratified sand and gravel.	GM, SM, ML, CL	A-2, A-4	0-10	60-95	50-90	40-85	30-85	20-40	1-10
Pope:											
Po----------------	0-8	Fine sandy loam, loam, silt loam.	ML, SM, CL-ML	A-2, A-1, A-4	0-5	85-100	75-100	40-85	15-55	<20	NP-5
	8-85	Silt loam, sandy loam, gravelly fine sandy loam.	SM, GM, CL-ML, SM-SC	A-2, A-1, A-4	0-5	65-100	60-100	35-95	15-70	<30	NP-7
Purdy:											
Pu----------------	0-9	Silt loam-------	ML, CL, CL-ML	A-4, A-5, A-6, A-7	0	95-100	90-100	90-100	90-100	25-50	2-25
	9-40	Silty clay loam, silty clay, clay.	ML, CL, CH, CL-ML	A-4, A-5, A-6, A-7	0	95-100	90-100	85-100	75-85	25-75	2-45
	40-60	Silty clay, clay loam, clay.	ML, CL, CH, CL-ML	A-4, A-5, A-6, A-7	0	95-100	90-100	85-100	70-95	25-75	2-45
Rubble land:											
Ru----------------	0-60	Variable--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Tyler:											
Ty-----------------	0-15	Silt loam--------	ML	A-4	0	100	100	95-100	80-95	30-40	4-10
	15-21	Silt loam, silty clay loam.	CL	A-6, A-5, A-7, A-4	0	100	100	95-100	85-100	25-45	8-20
	21-46	Silt loam, silty clay loam.	CL	A-6, A-5, A-7, A-4	0	100	100	80-100	70-95	25-45	8-20
	46-60	Stratified loam to silty clay loam.	CL, CL-ML	A-6, A-5, A-4, A-7	0	95-100	90-100	75-100	60-90	20-45	6-18
Vanderlip:											
VaC----------------	0-20	Loamy sand, sand	SM	A-2, A-4	0-5	95-100	75-100	70-100	25-45	---	---
	20-56	Loamy sand, sand, gravelly loamy sand, gravelly sand.	SM, SP, SP-SM, GW	A-1, A-2	0-10	60-100	45-100	25-75	2-30	<25	NP
	56-76	Very gravelly loamy sand, gravelly sand, loamy sand.	SM, SP-SM, GW, GP	A-1, A-2	0-20	45-100	25-100	15-75	2-30	<25	NP
Watson:											
WaB, WaC-----------	0-8	Gravelly silt loam.	ML, CL	A-4, A-6	0-10	70-95	70-95	60-90	55-85	---	---
	8-28	Gravelly silt loam, gravelly loam, gravelly silty clay loam.	ML, SC, GC	A-4, A-6, A-7	0-10	70-100	50-95	50-95	35-90	25-45	8-20
	28-60	Gravelly loam, gravelly silt loam, gravelly silty clay loam.	ML, CL, GC, SM	A-4, A-6, A-2	0-15	55-100	50-100	45-95	30-85	25-39	4-15
Weikert:											
WeB, WeC, WeD------	0-7	Shaly silt loam	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Very shaly silt loam, shaly silt loam, very shaly loam.	GM, SM, GW-GM, SW-SM	A-1, A-2	0-20	15-60	10-55	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < indicates less than. Entries under "Erosion factors-T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Allegheny:									
AbB	0-9	0.6-2.0	0.12-0.22	4.5-5.5	Low	Low	High	0.32	4
	9-40	0.6-2.0	0.13-0.18	4.5-5.5	Low	Low	High	---	
	40-67	0.6-2.0	0.08-0.17	4.5-5.5	Low	Low	High	---	
Allenwood:									
AdB, AdC, AdD	0-8	0.6-2.0	0.14-0.18	3.6-5.0	Low	Moderate	High	0.28	4
	8-41	0.2-2.0	0.12-0.16	3.6-5.0	Low	Moderate	High	0.17	
	41-60	0.2-2.0	0.03-0.10	3.6-5.0	Low	Moderate	High	0.17	
Alvira:									
AlB	0-10	0.6-2.0	0.16-0.20	3.6-5.5	Low	High	High	0.32	3-2
	10-25	0.6-2.0	0.14-0.18	3.6-5.5	Low	High	High	0.43	
	25-60	0.06-0.2	0.08-0.12	3.6-5.5	Low	High	High	0.28	
Andover:									
AnB	0-6	0.6-2.0	0.08-0.18	4.5-5.5	Low	High	High	0.37	3-2
	6-18	0.6-2.0	0.08-0.12	4.5-5.5	Low	High	High	0.17	
	18-50	0.06-0.2	0.06-0.10	4.5-5.5	Low	High	High	0.17	
	50-60	0.06-0.6	0.08-0.12	4.5-5.5	Low	High	High	0.17	
AoB, AoC	0-6	0.6-2.0	0.08-0.20	4.5-5.5	Low	High	High	0.37	3-2
	6-18	0.6-2.0	0.08-0.12	4.5-5.5	Low	High	High	0.17	
	18-50	0.06-0.2	0.06-0.10	4.5-5.5	Low	High	High	0.17	
	50-60	0.06-0.6	0.08-0.12	4.5-5.5	Low	High	High	0.17	
Ashton:									
As	0-9	0.6-2.0	0.16-0.23	5.6-7.3	Low	Low	Low	0.28	4
	9-43	0.6-2.0	0.18-0.23	5.6-7.3	Low	Low	Low	---	
	43-60	0.6-2.0	0.14-0.20	5.6-7.3	Low	Low	Low	---	
Atkins:									
At	0-8	0.6-2.0	0.14-0.22	4.5-5.5	Low	High	High	0.49	4
	8-40	0.06-2.0	0.14-0.18	4.5-5.5	Low	High	High	---	
	40-66	0.2-6.0	0.08-0.18	4.5-5.5	Low	High	High	---	
Berks:									
BkB, BkC	0-5	2.0-6.0	0.08-0.12	4.5-5.5	Low	Low	High	0.24	3
	5-27	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	27-32	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	32	---	---	---	---	---	---	---	
1BlD:									
Berks part	0-5	2.0-6.0	0.08-0.12	4.5-5.5	Low	Low	High	0.24	3
	5-27	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	27-32	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	32	---	---	---	---	---	---	---	
Weikert part	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	High	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	High	0.28	
	18	---	---	---	---	---	---	---	
1BMF:									
Berks part	0-5	2.0-6.0	0.08-0.12	4.5-5.5	Low	Low	High	0.24	3
	5-27	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	27-32	2.0-6.0	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	32	---	---	---	---	---	---	---	
Weikert part	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	High	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	High	0.28	
	18	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Brinkerton:									
BrA, BrB	0-7	0.6-2.0	0.18-0.24	4.5-6.0	Low	High	High	0.43	3-2
	7-16	0.6-2.0	0.14-0.18	4.5-6.0	Moderate	High	High	0.32	
	16-45	0.06-0.2	0.08-0.12	4.5-6.0	Moderate	High	High	0.32	
	45-65	0.06-0.6	0.14-0.18	5.1-6.5	Low	High	Moderate	0.20	
Buchanan:									
BuB, BuC	0-7	0.6-2.0	0.12-0.18	3.6-5.5	Moderate	High	High	0.28	3-2
	7-16	0.6-2.0	0.10-0.16	3.6-5.5	Moderate	High	High	0.28	
	16-65	0.06-0.2	0.06-0.10	3.6-5.5	Moderate	High	High	0.17	
BxB, BxD	0-7	0.6-2.0	0.11-0.16	3.6-5.5	Moderate	High	High	0.28	3-2
	7-16	0.6-2.0	0.10-0.16	3.6-5.5	Moderate	High	High	0.28	
	16-65	0.06-0.2	0.06-0.10	3.6-5.5	Moderate	High	High	0.17	
Chavies:									
CaB	0-10	2.0-6.0	0.11-0.18	5.1-6.0	Low	Low	Moderate	0.24	4
	10-40	2.0-6.0	0.11-0.20	5.1-6.0	Low	Low	Moderate	---	
	40-76	2.0-6.0	0.11-0.18	5.1-6.0	Low	Low	Moderate	---	
Edom:									
EdB, EdC, EdD	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
[1]EeB:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Klinesville part	0-6	2.0-6.0	0.08-0.12	4.5-6.0	Low	Low	High	0.20	2
	6-12	2.0-6.0	0.06-0.10	4.5-6.0	Low	Low	High	0.28	
	12-19	2.0-6.0	0.04-0.08	4.5-6.0	Low	Low	High	0.28	
	19	---	---	---	---	---	---	---	
[1]EeC:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Klinesville part	0-6	2.0-6.0	0.08-0.12	4.5-6.0	Low	Low	High	0.20	2
	6-12	2.0-6.0	0.06-0.10	4.5-6.0	Low	Low	High	0.28	
	12-19	2.0-6.0	0.04-0.08	4.5-6.0	Low	Low	High	0.28	
	19	---	---	---	---	---	---	---	
[1]EeD:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Klinesville part	0-6	2.0-6.0	0.08-0.12	4.5-6.0	Low	Low	High	0.20	2
	6-12	2.0-6.0	0.06-0.10	4.5-6.0	Low	Low	High	0.28	
	12-19	2.0-6.0	0.04-0.08	4.5-6.0	Low	Low	High	0.28	
	19	---	---	---	---	---	---	---	
[1]EfB:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Weikert part	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	High	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	High	0.28	
	18	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Edom:									
[1]EfC:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Weikert part	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	High	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	High	0.28	
	18	---	---	---	---	---	---	---	
[1]EfD:									
Edom part	0-8	0.6-2.0	0.14-0.20	5.6-7.8	Low	High	Low	0.28	3
	8-36	0.2-2.0	0.10-0.14	5.6-7.8	Moderate	High	Low	0.28	
	36-46	0.2-2.0	0.04-0.08	5.6-7.8	Moderate	High	Low	0.17	
	46	---	---	---	---	---	---	---	
Weikert part	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	High	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	High	0.28	
	18	---	---	---	---	---	---	---	
Elliber: ElB, ElC, ElD, ElF	0-15	2.0-6.0	0.08-0.12	4.5-5.5	Low	Low	High	0.17	4-3
	15-71	2.0-6.0	0.08-0.10	4.5-5.5	Low	Low	High	0.17	
Ernest: ErB, ErC	0-10	0.6-2.0	0.14-0.20	4.5-5.5	Low	Moderate	High	0.43	3
	10-24	0.6-2.0	0.12-0.16	4.5-5.5	Moderate	Moderate	High	0.28	
	24-40	0.2-0.6	0.08-0.12	4.5-5.5	Moderate	Moderate	High	0.28	
	40-60	0.2-0.6	0.08-0.12	4.5-5.5	Moderate	Moderate	High	0.28	
Evendale: Ev	0-7	0.6-2.0	0.14-0.18	4.5-7.3	Low	High	Moderate	0.37	3
	7-60	0.06-0.2	0.14-0.20	4.5-7.3	Moderate	High	Moderate	---	
	51-64	0.06-0.6	0.08-0.16	4.5-5.5	Moderate	High	High	---	
Hagerstown: HaB, HcB, HcC, HcD	0-14	0.6-6.0	0.16-0.24	5.6-7.3	Low	Moderate	Low	0.32	4
	14-40	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
	40-60	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
[1]HeB:									
Hagerstown part	0-14	0.6-6.0	0.16-0.24	5.6-7.3	Low	Moderate	Low	0.32	4
	14-40	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
	40-60	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
Rock outcrop part.									
[1]HeD:									
Hagerstown part	0-14	0.6-6.0	0.16-0.24	5.6-7.3	Low	Moderate	Low	0.32	4
	14-40	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
	40-60	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
Rock outcrop part.									
Hazleton: HhB, HhC, HhD	0-6	2.0-6.0	0.10-0.14	4.5-5.5	Low	Low	High	0.24	3-2
	6-36	2.0-20	0.08-0.12	4.5-5.5	Low	Low	High	0.17	
	36-60	2.0-20	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	56	---	---	---	---	---	---	---	
[1]HSB:									
Hazleton part	0-6	2.0-6.0	0.10-0.14	4.5-5.5	Low	Low	High	0.24	3-2
	6-36	2.0-20	0.08-0.12	4.5-5.5	Low	Low	High	0.17	
	36-60	2.0-20	0.04-0.10	4.5-5.5	Low	Low	High	0.17	
	56	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Hazleton:									
Dekalb part-----	0-9	6.0-20	0.08-0.12	4.5-5.5	Low--------	Low------------	High------------	0.24	3
	9-25	6.0-20	0.06-0.12	4.5-5.5	Low--------	Low------------	High------------	0.17	
	25	---	---	---	-----------	---------------	----------------	---	
[1]HSD:									
Hazleton part---	0-6	2.0-6.0	0.10-0.14	4.5-5.5	Low--------	Low------------	High------------	0.24	3-2
	6-36	2.0-20	0.08-0.12	4.5-5.5	Low--------	Low------------	High------------	0.17	
	36-60	2.0-20	0.04-0.10	4.5-5.5	Low--------	Low------------	High------------	0.17	
	56	---	---	---	-----------	---------------	----------------	---	
Dekalb part-----	0-9	6.0-20	0.08-0.12	4.5-5.5	Low--------	Low------------	High------------	0.24	3
	9-25	6.0-20	0.06-0.12	4.5-5.5	Low--------	Low------------	High------------	0.17	
	25	---	---	---	-----------	---------------	----------------	---	
[1]HTF:									
Hazleton part---	0-6	2.0-6.0	0.10-0.14	4.5-5.5	Low--------	Low------------	High------------	0.24	3-2
	6-36	2.0-20	0.08-0.12	4.5-5.5	Low--------	Low------------	High------------	0.17	
	36-60	2.0-20	0.04-0.10	4.5-5.5	Low--------	Low------------	High------------	0.17	
	56	---	---	---	-----------	---------------	----------------	---	
Dekalb part-----	0-9	6.0-20	0.08-0.12	4.5-5.5	Low--------	Low------------	High------------	0.24	3
	9-25	6.0-20	0.06-0.12	4.5-5.5	Low--------	Low------------	High------------	0.17	
	25	---	---	---	-----------	---------------	----------------	---	
Klinesville:									
KlB, KlC, KlD, KlF	0-6	2.0-6.0	0.08-0.12	4.5-6.0	Low--------	Low------------	High------------	0.20	2
	6-12	2.0-6.0	0.06-0.10	4.5-6.0	Low--------	Low------------	High------------	0.28	
	12-19	2.0-6.0	0.04-0.08	4.5-6.0	Low--------	Low------------	High------------	0.28	
	19	---	---	---	-----------	---------------	----------------	---	
Kreamer:									
KrB, KrC-----------	0-8	0.6-2.0	0.12-0.16	4.5-7.3	Low--------	High-----------	Moderate--------	0.28	3
	8-20	0.06-0.2	0.10-0.14	4.5-7.3	Moderate	High-----------	Moderate--------	0.17	
	20-67	0.06-0.2	0.10-0.14	4.5-5.5	Moderate	High-----------	High------------	0.17	
Laidig:									
LaB, LaC, LaD------	0-10	0.6-6.0	0.10-0.14	4.5-5.5	Low--------	Moderate-------	High------------	0.28	4
	10-30	0.6-2.0	0.08-0.12	4.5-5.5	Low--------	Moderate-------	High------------	0.28	
	30-65	0.2-0.6	0.06-0.10	4.5-5.5	Low--------	Moderate-------	High------------	0.17	
LcB, LcD, LDF------	0-10	0.6-6.0	0.08-0.12	4.5-5.5	Low--------	Moderate-------	High------------	0.28	4
	10-30	0.6-2.0	0.08-0.12	4.5-5.5	Low--------	Moderate-------	High------------	0.28	
	30-65	0.2-0.6	0.06-0.10	4.5-5.5	Low--------	Moderate-------	High------------	0.17	
Leetonia:									
LtB----------------	0-6	2.0-6.0	0.03-0.05	3.6-5.0	Low--------	Low------------	High------------	0.17	3
	6-17	2.0-6.0	0.03-0.05	3.6-5.0	Low--------	Low------------	High------------	0.17	
	17-48	2.0-6.0	0.02-0.03	3.6-5.0	Low--------	Low------------	High------------	0.17	
	48	---	---	---	-----------	---------------	----------------	---	
Melvin:									
Ma-----------------	0-9	0.6-2.0	0.18-0.23	6.1-7.8	Low--------	High-----------	Low-------------	0.49	4
	9-60	0.6-2.0	0.18-0.23	6.1-7.8	Low--------	High-----------	Low-------------	---	
Mertz:									
MeB, MeC, MeD------	0-9	0.6-2.0	0.14-0.18	5.1-6.5	Low--------	Moderate-------	Moderate--------	0.28	4
	9-47	0.2-0.6	0.08-0.18	4.5-6.5	Moderate	Moderate-------	Moderate--------	0.17	
	47-63	0.2-0.6	0.08-0.18	4.5-5.5	Moderate	Moderate-------	High------------	0.17	
Millheim:									
MnB, MnC-----------	0-6	0.6-6.0	0.14-0.21	4.5-6.0	Moderate	High-----------	Moderate--------	0.28	3-2
	6-36	0.6-2.0	0.08-0.18	4.5-7.3	Moderate	High-----------	Moderate--------	0.17	
	36-42	0.6-2.0	0.06-0.18	5.6-7.3	Moderate	High-----------	Low-------------	0.17	
	42	---	---	---	-----------	---------------	----------------	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Monongahela:									
MoA, MoB	0-10	0.6-2.0	0.18-0.24	4.5-5.5	Low	Moderate	High	0.43	3
	10-28	0.6-2.0	0.14-0.18	4.5-5.5	Low	Moderate	High	0.43	
	28-56	0.06-2.0	0.08-0.12	4.5-5.5	Low	Moderate	High	0.43	
	56-70	0.2-0.6	0.08-0.12	4.5-5.5	Low	Moderate	High	0.43	
Morrison:									
MrB, MrC, MrD	0-9	0.6-6.0	0.10-0.14	3.6-5.5	Low	Low	High	0.17	3
	9-50	0.6-6.0	0.08-0.12	3.6-6.0	Low	Low	High	0.17	
	50-72	0.6-6.0	0.06-0.10	5.1-6.0	Low	Low	Moderate	0.17	
Murrill:									
MuB, MuC	0-14	0.6-2.0	0.12-0.16	4.5-5.5	Low	Moderate	High	0.24	4
	14-31	0.6-2.0	0.10-0.14	4.5-5.5	Low	Moderate	High	0.17	
	31-80	0.6-2.0	0.08-0.12	4.5-5.5	Low	Moderate	High	0.28	
Newark:									
Ne	0-8	0.6-2.0	0.15-0.23	5.6-7.8	Low	High	Low	0.49	4
	8-50	0.6-2.0	0.18-0.23	5.6-7.8	Low	High	Low	---	
	50-60	0.6-2.0	0.15-0.22	5.6-7.8	Low	High	Low	---	
Nolin:									
No	0-10	0.6-2.0	0.18-0.23	6.1-7.3	Low	Low	Moderate	0.43	3-2
	10-60	0.6-2.0	0.18-0.23	6.1-7.3	Low	Low	Moderate	---	
Opequon:									
OpB, OpC, OpD	0-8	0.06-2.0	0.16-0.21	5.6-7.3	High	High	Low	0.43	2
	8-16	0.06-2.0	0.12-0.16	5.6-7.3	High	High	Low	0.28	
	16	---	---	---	---	---	---	---	
[1]ORF:									
Opequon part	0-8	0.06-2.0	0.16-0.21	5.6-7.3	High	High	Low	0.43	2
	8-16	0.06-2.0	0.12-0.16	5.6-7.3	High	High	Low	0.28	
	16	---	---	---	---	---	---	---	
Hagerstown part	0-14	0.6-6.0	0.16-0.24	5.6-7.3	Low	Moderate	Low	0.32	4
	14-40	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
	40-60	0.6-2.0	0.10-0.24	5.6-7.3	Moderate	High	Low	0.28	
Penlaw:									
Pe	0-11	0.6-2.0	0.16-0.20	5.6-7.3	Low	High	Low	0.43	3-2
	11-30	0.6-2.0	0.16-0.20	5.6-7.3	Moderate	High	Low	0.24	
	30-45	0.06-0.2	0.10-0.16	5.6-7.3	Moderate	High	Low	0.24	
	45-69	0.06-0.6	0.12-0.16	5.6-7.3	Moderate	High	Low	0.24	
Philo:									
Ph	0-42	0.2-2.0	0.12-0.20	4.5-6.0	Low	Moderate	Moderate	0.49	4
	42-60	2.0-20	0.06-0.10	4.5-6.0	Low	Moderate	High	---	
Pope:									
Po	0-8	2.0-6.0	0.08-0.14	4.5-5.5	Low	Low	High	0.49	4
	8-85	0.6-6.0	0.08-0.15	4.5-5.5	Low	Low	High	---	
Purdy:									
Pu	0-9	0.2-0.6	0.18-0.24	3.6-5.5	Moderate	High	High	0.43	3
	9-40	<0.2	0.12-0.18	3.6-5.5	Moderate	High	High	0.28	
	40-60	<0.2	0.10-0.16	3.6-5.5	Moderate	High	High	0.28	
Rubble land:									
Ru	0-60	---	---	---	---	---	---	---	---
Tyler:									
Ty	0-15	0.6-2.0	0.18-0.22	3.6-5.5	Low	High	High	0.43	3
	15-21	0.2-0.6	0.16-0.20	3.6-5.5	Moderate	High	High	0.43	
	21-46	<0.2	0.02-0.08	3.6-5.5	Low	High	High	0.43	
	46-60	0.2-0.6	0.02-0.08	4.5-6.0	Low	High	Moderate	0.43	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink- swell potential	Risk of corrosion		Erosion factors	
						Uncoated steel	Concrete	K	T
	In	In/hr	In/in	pH					
Vanderlip:									
VaC	0-20	6.0-20	0.08-0.12	4.5-6.0	Low	Low	High	0.24	3-2
	20-56	6.0-20	0.06-0.10	4.5-6.0	Low	Low	High	0.17	
	56-76	6.0-20	0.04-0.10	4.5-6.0	Low	Low	High	0.10	
Watson:									
WaB, WaC	0-8	0.6-2.0	0.12-0.16	4.5-5.5	Moderate	Moderate	Moderate	0.24	3-2
	8-28	0.6-2.0	0.12-0.16	4.5-5.5	Moderate	Moderate	Moderate	0.17	
	28-60	0.06-0.2	0.08-0.12	4.5-5.5	Moderate	Moderate	Moderate	0.17	
Weikert:									
WeB, WeC, WeD	0-7	2.0-20	0.08-0.14	4.5-5.5	Low	Low	Moderate	0.28	2
	7-18	2.0-20	0.04-0.08	4.5-5.5	Low	Low	Moderate	0.28	
	18	---	---	---	-----	-----	-----	---	

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain such terms as "rare," "brief," and "perched." The symbol > means greater than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Allegheny: AbB	B	None	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Moderate.
Allenwood: AdB, AdC, AdD	B	None	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Moderate.
Alvira: AlB	C	None	---	---	0.5-1.5	Perched	Oct-May	>40	Rippable	High.
Andover: AnB, AoB, AoC	D	None	---	---	0.0-0.5	Perched	Oct-Jun	>60	---	High.
Ashton: As	B	Rare	Brief	(2)	>6.0	---	---	>60	---	---
Atkins: At	D	Common	Brief	(2)	0.0-0.5	Apparent	Nov-Jun	48-60	Hard	High.
Berks: BkB, BkC	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
[1]BlD: Berks part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Weikert part	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]BMF: Berks part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Weikert part	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Brinkerton: BrA, BrB	D	None	---	---	0.0-0.5	Perched	Oct-Jun	>72	---	High.
Buchanan: BuB, BuC, BxB, BxD	C	None	---	---	0.5-3.0	Perched	Nov-May	>60	---	Moderate.
Chavies: CaB	B	Rare	Brief	(2)	>6.0	---	---	>60	---	---
Edom: EdB, EdC, EdD	C	None	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
[1]EeB: Edom part	C	None	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
Klinesville part	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]EeC: Edom part	C	None	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
Klinesville part	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]EeD: Edom part	C	None	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
Klinesville part	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]EfB: Edom part	C	None	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Edom:										
Weikert part---	C/D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]EfC:										
Edom part------	C	None---------	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
Weikert part---	C/D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
[1]EfD:										
Edom part------	C	None---------	---	---	4.0-7.0	Apparent	Dec-Apr	40-72	Rippable	Moderate.
Weikert part---	C/D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Elliber: ElB, ElC, ElD, ElF---------------	A	None---------	---	---	>6.0	---	---	>60	---	Moderate.
Ernest: ErB, ErC----------	C	None---------	---	---	1.5-2.5	Perched	Dec-Apr	>72	---	Moderate.
Evendale: Ev----------------	C	None---------	---	---	0.5-1.5	Perched	Nov-May	>60	---	High.
Hagerstown: HaB, HcB, HcC, HcD---------------	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate.
[1]HeB:										
Hagerstown part	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate.
Rock outcrop part.										
[1]HeD:										
Hagerstown part	C	None---------	---	---	>6.0	---	---	>40	Hard	Moderate.
Rock outcrop part.										
Hazleton: HhB, HhC, HhD-----	B	None---------	---	---	>6.0	---	---	40-72	Hard	Moderate.
[1]HSB:										
Hazleton part--	B	None---------	---	---	>6.0	---	---	40-72	Hard	Moderate.
Dekalb part-----	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
[1]HSD:										
Hazleton part--	B	None---------	---	---	>6.0	---	---	40-72	Hard	Moderate.
Dekalb part-----	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
[1]HTF:										
Hazleton part--	B	None---------	---	---	>6.0	---	---	40-72	Hard	Moderate.
Dekalb part-----	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low.
Klinesville: KlB, KlC, KlD, KlF---------------	C/D	None---------	---	---	>6.0	---	---	10-20	Rippable	Moderate.
Kreamer: KrB, KrC----------	C	None---------	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	High.
Laidig: LaB, LaC, LaD, LcB, LcD, LDF-----	C	None---------	---	---	3.0-4.0	Perched	Jan-Mar	>60	---	Low.
Leetonia: LtB---------------	C	None---------	---	---	4.0-7.0	Apparent	---	40-48	Hard	Low.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	
					Ft			In		
Melvin: Ma	D	Common	Brief	(2)	0.0-0.5	Apparent	Oct-May	>72	---	High.
Mertz: MeB, MeC, MeD	C	None	---	---	>6.0	---	---	>72	---	Moderate.
Millheim: MnB, MnC	C	None	---	---	>6.0	---	---	42-60	Rippable	Moderate.
Monongahela: MoA, MoB	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>72	---	High.
Morrison: MrB, MrC, MrD	B	None	---	---	>6.0	---	---	>72	---	Moderate.
Murrill: MuB, MuC	B	None	---	---	4.0-5.0	Perched	Dec-Apr	>72	---	Moderate.
Newark: Ne	C	Common	Brief	(2)	0.5-1.0	Apparent	Oct-May	>72	---	High.
Nolin: No	B	Common	Brief	(2)	3.5-6.0	Apparent	Feb-Mar	42-72	Hard	High.
Opequon: OpB, OpC, OpD	C	None	---	---	>6.0	---	---	12-20	Hard	Moderate.
[1]ORF: Opequon part	C	None	---	---	>6.0	---	---	12-20	Hard	Moderate.
Hagerstown part	C	None	---	---	>6.0	---	---	>40	Hard	Moderate.
Penlaw: Pe	C	None	---	---	0.5-1.5	Perched	Nov-May	40-72	Hard	High.
Philo: Ph	B	Common	Brief	(2)	1.5-3.0	Apparent	Dec-Apr	>40	Hard	Moderate.
Pope: Po	B	Common	Brief	(2)	>4.0	Apparent	Feb-Mar	>72	---	Moderate.
Purdy: Pu	D	None	---	---	0-0.5	Apparent	Oct-Jun	>48	---	High.
Rubble land: Ru	---	None	---	---	---	---	---	---	---	---
Tyler: Ty	D	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	High.
Vanderlip: VaC	A	None	---	---	>6.0	---	---	>40	Hard	Low.
Watson: WaB, WaC	C	None	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate.
Weikert: WeB, WeC, WeD	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate.

[1]This map unit is made up of two or more dominant kinds of soil. See description of map unit for the composition and behavior characteristics of the map unit.

[2]Flooding is more likely to occur during winter or early spring; however, on rare occasions it may occur during other seasons of the year.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Allenwood	Fine-loamy, mixed, mesic Typic Hapludults
Alvira	Fine-loamy, mixed, mesic Aeric Fragiaquults
Andover	Fine-loamy, mixed, mesic Typic Fragiaquults
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Atkins	Fine-loamy, mixed, acid, mesic Typic Fluvaquents
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Brinkerton	Fine-silty, mixed, mesic Typic Fragiaqualfs
Buchanan	Fine-loamy, mixed, mesic Aquic Fragiudults
Chavies	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Edom	Fine, illitic, mesic Typic Hapludalfs
Elliber	Loamy-skeletal, mixed, mesic Typic Hapludults
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults
Evendale	Clayey, mixed, mesic Aeric Ochraquults
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Klinesville	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Kreamer	Clayey, mixed, mesic Aquic Hapludults
Laidig	Fine-loamy, mixed, mesic Typic Fragiudults
Leetonia	Sandy-skeletal, siliceous, mesic Entic Haplorthods
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Mertz	Loamy-skeletal, mixed, mesic Typic Hapludults
Millheim	Fine, illitic, mesic Typic Hapludalfs
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Morrison	Fine-loamy, mixed, mesic Ultic Hapludalfs
Murrill	Fine-loamy, mixed, mesic Typic Hapludults
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Opequon	Clayey, mixed, mesic Lithic Hapludalfs
Penlaw	Fine-silty, mixed, mesic Aquic Fragiudalfs
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Purdy	Clayey, mixed, mesic Typic Ochraquults
Tyler	Fine-silty, mixed, mesic Aeric Fragiaquults
Vanderlip	Mesic, coated Typic Quartzipsamments
Watson	Fine-loamy, mixed, mesic Typic Fragiudults
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts

☆U.S. GOVERNMENT PRINTING OFFICE : 1981—248-335/78

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

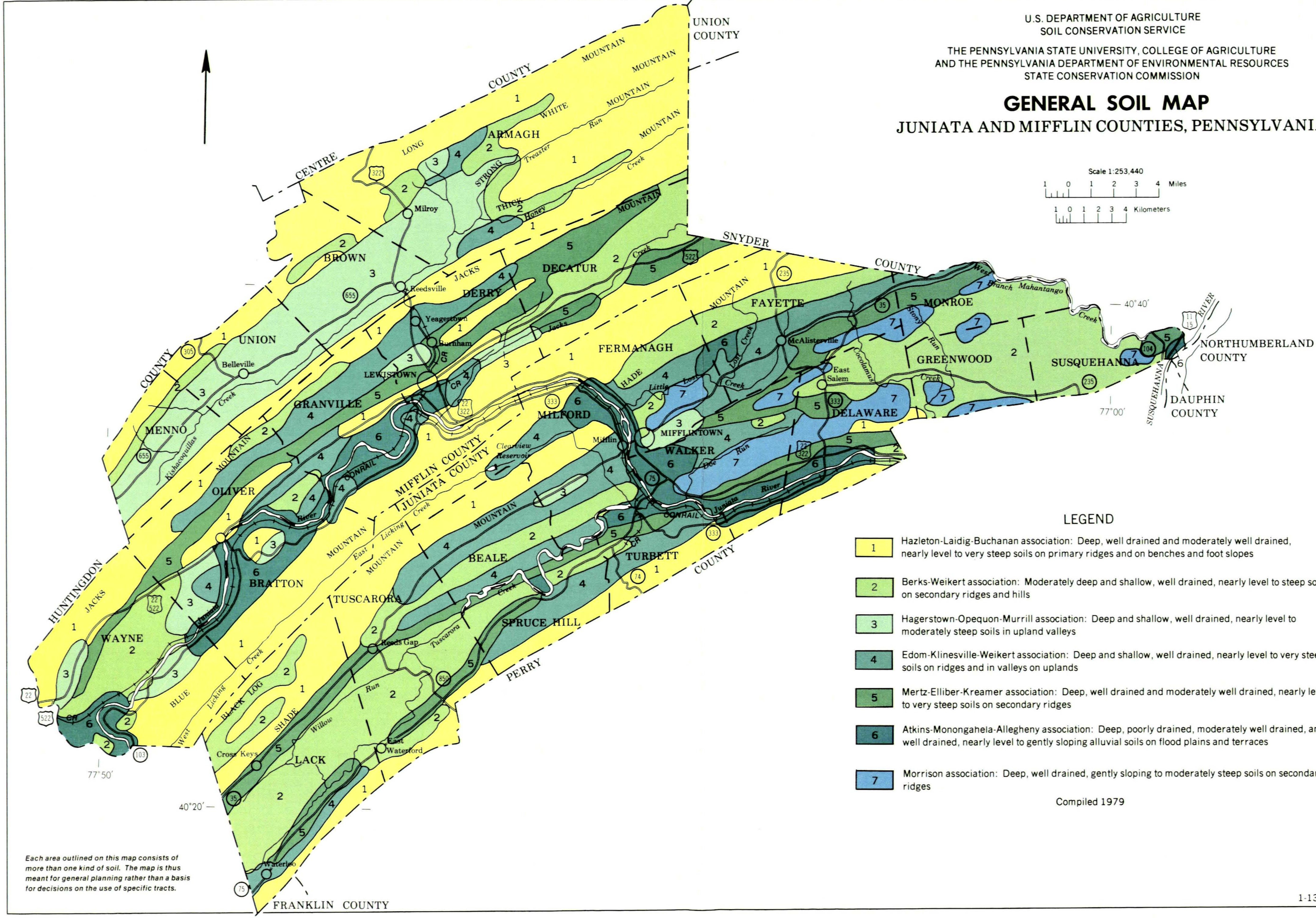
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

THE PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE
AND THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
STATE CONSERVATION COMMISSION

GENERAL SOIL MAP

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA

Scale 1:253,440

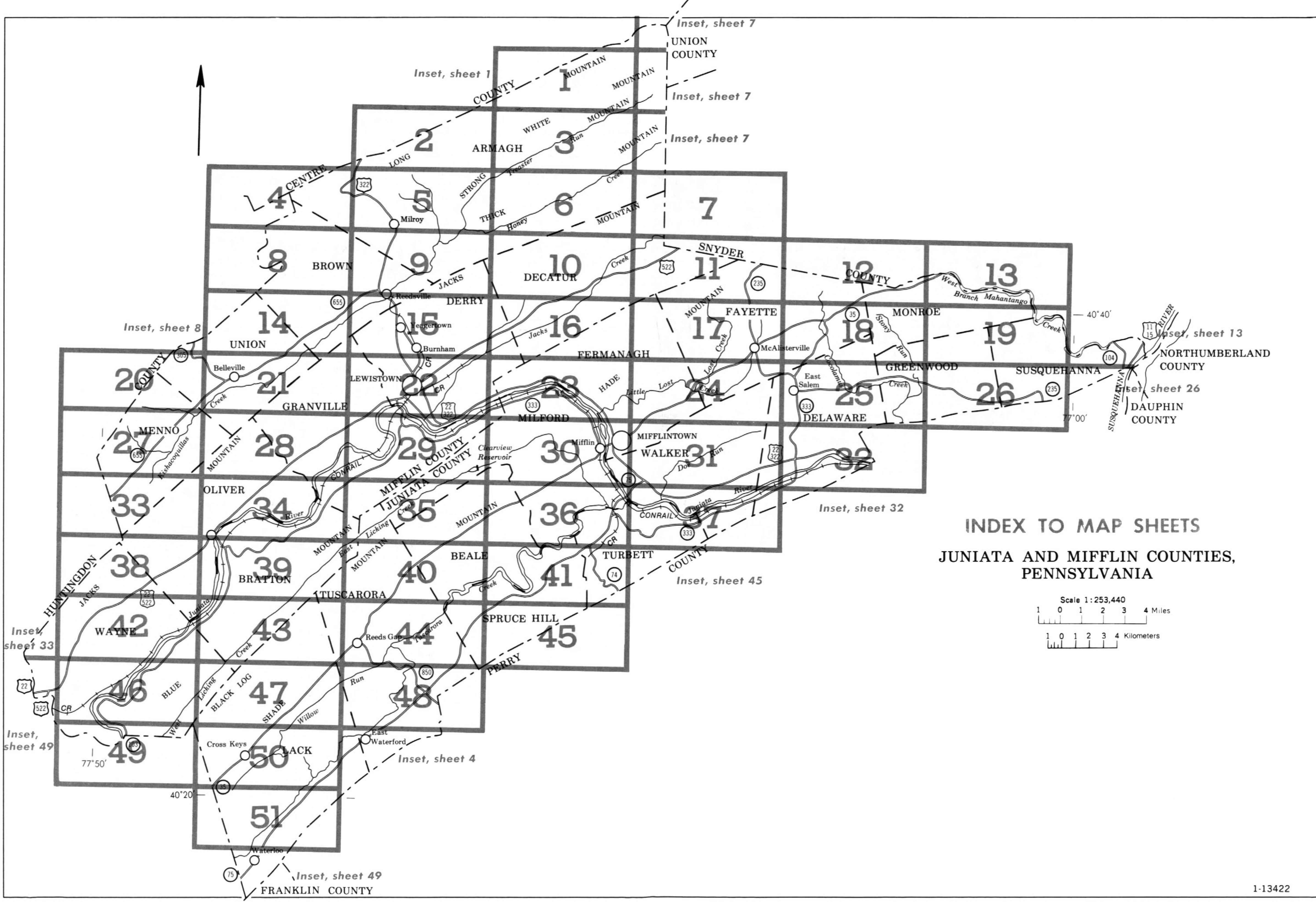


LEGEND

1. Hazleton-Laidig-Buchanan association: Deep, well drained and moderately well drained, nearly level to very steep soils on primary ridges and on benches and foot slopes
2. Berks-Weikert association: Moderately deep and shallow, well drained, nearly level to steep soils on secondary ridges and hills
3. Hagerstown-Opequon-Murrill association: Deep and shallow, well drained, nearly level to moderately steep soils in upland valleys
4. Edom-Klinesville-Weikert association: Deep and shallow, well drained, nearly level to very steep soils on ridges and in valleys on uplands
5. Mertz-Elliber-Kreamer association: Deep, well drained and moderately well drained, nearly level to very steep soils on secondary ridges
6. Atkins-Monongahela-Allegheny association: Deep, poorly drained, moderately well drained, and well drained, nearly level to gently sloping alluvial soils on flood plains and terraces
7. Morrison association: Deep, well drained, gently sloping to moderately steep soils on secondary ridges

Compiled 1979

1-13422


INDEX TO MAP SHEETS
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA
Scale 1:253,440
1 0 1 2 3 4 Miles
1 0 1 2 3 4 Kilometers
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
Inset, sheet 7
UNION COUNTY
Inset, sheet 1
CENTRE COUNTY
Inset, sheet 8
HUNTINGDON COUNTY
Inset, sheet 33
Inset, sheet 49
SNYDER COUNTY
Inset, sheet 13
NORTHUMBERLAND COUNTY
Inset, sheet 26
DAUPHIN COUNTY
Inset, sheet 32
Inset, sheet 45
PERRY COUNTY
Inset, sheet 4
FRANKLIN COUNTY
MIFFLIN COUNTY
JUNIATA COUNTY
ARMAGH
BROWN
DECATUR
DERRY
UNION
MENNO
GRANVILLE
OLIVER
WAYNE
BRATTON
FAYETTE
MONROE
FERMANAGH
GREENWOOD
SUSQUEHANNA
DELAWARE
MILFORD
WALKER
BEALE
TURBETT
TUSCARORA
SPRUCE HILL
LACK
Milroy
Reedsville
Yeagertown
Burnham
Belleville
LEWISTOWN
Mifflin
MIFFLINTOWN
McAlisterville
East Salem
Reeds Gap
East Waterford
Cross Keys
Waterloo
Clearview Reservoir
CONRAIL
SUSQUEHANNA RIVER
40°40′
40°20′
77°00′
77°50′
1-13422

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

SOIL LEGEND

The first letter, always a capital, is the initial letter of the soil name. The second is usually a small letter but it is a capital letter if the unit is broadly defined. The third letter, A, B, C, D, or F is the slope. Most symbols without a slope letter are for nearly level soils, but one is for a miscellaneous land type.

SYMBOL	NAME
AbB	Allegheny loam, 2 to 8 percent slopes
AdB	Allenwood gravelly silt loam, 2 to 8 percent slopes
AdC	Allenwood gravelly silt loam, 8 to 15 percent slopes
AdD	Allenwood gravelly silt loam, 15 to 25 percent slopes
AlB	Alvira silt loam, 2 to 8 percent slopes
AnB	Andover gravelly loam, 2 to 8 percent slopes
AoB	Andover extremely stony loam, 0 to 8 percent slopes
AoC	Andover extremely stony loam, 8 to 15 percent slopes
As	Ashton silt loam
At	Atkins silt loam
BkB	Berks shaly silt loam, 2 to 8 percent slopes
BkC	Berks shaly silt loam, 8 to 15 percent slopes
BlD	Berks - Weikert shaly silt loams, 15 to 25 percent slopes
BMF	Berks - Weikert association, steep
BrA	Brinkerton silt loam, 0 to 3 percent slopes
BrB	Brinkerton silt loam, 3 to 8 percent slopes
BuB	Buchanan gravelly loam, 3 to 8 percent slopes
BuC	Buchanan gravelly loam, 8 to 15 percent slopes
BxB	Buchanan extremely stony loam, 3 to 8 percent slopes
BxD	Buchanan extemely stony loam, 8 to 15 percent slopes
CaB	Chavies loam, 2 to 8 percent slopes
EdB	Edom silty clay loam, 3 to 8 percent slopes
EdC	Edom silty clay loam, 8 to 15 percent slopes
EdD	Edom silty clay loam, 15 to 25 percent slopes
EeB	Edom - Klinesville complex, 3 to 8 percent slopes
EeC	Edom - Klinesville complex, 8 to 15 percent slopes
EeD	Edom - Klinesville complex, 15 to 25 percent slopes
EfB	Edom - Weikert complex, 3 to 8 percent slopes
EfC	Edom - Weikert complex, 8 to 15 percent slopes
EfD	Edom - Weikert complex, 15 to 25 percent slopes
ElB	Elliber very cherty loam, 3 to 8 percent slopes
ElC	Elliber very cherty loam, 8 to 15 percent slopes
ElD	Elliber very cherty loam, 15 to 25 percent slopes
ElF	Elliber very cherty loam, 25 to 60 percent slopes
ErB	Ernest silt loam, 2 to 8 percent slopes
ErC	Ernest silt loam, 8 to 15 percent slopes
Ev	Evendale cherty silt loam
HaB	Hagerstown silt loam, 2 to 8 percent slopes
HcB	Hagerstown silty clay loam, 3 to 8 percent slopes
HcC	Hagerstown silty clay loam, 8 to 15 percent slopes
HcD	Hagerstown silty clay loam, 15 to 25 percent slopes
HeB	Hagerstown - Rock outcrop complex, 0 to 8 percent slopes
HeD	Hagerstown - Rock outcrop complex, 8 to 25 percent slopes
HhB	Hazleton channery loam, 3 to 8 percent slopes
HhC	Hazleton channery loam, 8 to 15 percent slopes
HhD	Hazleton channery loam, 15 to 25 percent slopes
HSB	Hazleton - Dekalb extremely stony sandy loams, gently sloping
HSD	Hazleton - Dekalb extremely stony sandy loams, moderately steep
HTF	Hazleton - Dekalb association, steep
KlB	Klinesville shaly silt loam, 3 to 8 percent slopes
KlC	Klinesville shaly silt loam, 8 to 15 percent slopes
KlD	Klinesville shaly silt loam, 15 to 25 percent slopes
KlF	Klinesville shaly silt loam, 25 to 50 percent slopes
KrB	Kreamer cherty silt loam, 2 to 8 percent slopes
KrC	Kreamer cherty silt loam, 8 to 15 percent slopes
LaB	Laidig channery loam, 3 to 8 percent slopes
LaC	Laidig channery loam, 8 to 15 percent slopes
LaD	Laidig channery loam, 15 to 25 percent slopes
LcB	Laidig extremely stony loam, 3 to 8 percent slopes
LcD	Laidig extremely stony loam, 8 to 25 percent slopes
LDF	Laidig extremely stony loam, steep
LtB	Leetonia extremely stony loamy sand, 0 to 12 percent slopes
Ma	Melvin silt loam
MeB	Mertz cherty silt loam, 3 to 8 percent slopes
MeC	Mertz cherty silt loam, 8 to 15 percent slopes
MeD	Mertz cherty silt loam, 15 to 25 percent slopes
MnB	Millheim silt loam, 3 to 8 percent slopes
MnC	Millheim silt loam, 8 to 15 percent slopes
MoA	Monongahela silt loam, 0 to 3 percent slopes
MoB	Monongahela silt loam, 3 to 8 percent slopes
MrB	Morrison gravelly sandy loam, 3 to 8 percent slopes
MrC	Morrison gravelly sandy loam, 8 to 15 percent slopes
MrD	Morrison gravelly sandy loam, 15 to 25 percent slopes
MuB	Murrill gravelly loam, 3 to 8 percent slopes
MuC	Murrill gravelly loam, 8 to 15 percent slopes
Ne	Newark silt loam
No	Nolin silt loam
OpB	Opequon silty clay loam, 3 to 8 percent slopes
OpC	Opequon silty clay loam, 8 to 15 percent slopes
OpD	Opequon silty clay loam, 15 to 25 percent slopes
ORF	Opequon - Hagerstown complex, steep
Pe	Penlaw silt loam
Ph	Philo silt loam
Po	Pope soils
Pu	Purdy silt loam
Ru	Rubble land
Ty	Tyler silt loam
VaC	Vanderlip loamy sand, 5 to 15 percent slopes
WaB	Watson gravelly silt loam, 2 to 8 percent slopes
WaC	Watson gravelly silt loam, 8 to 15 percent slopes
WeB	Weikert shaly silt loam, 3 to 8 percent slopes
WeC	Weikert shaly silt loam, 8 to 15 percent slopes
WeD	Weikert shaly silt loam, 15 to 25 percent slopes

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool — Davis Airstrip; FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 79
- Federal — 410
- State — 52
- County, farm or ranch — 378

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water; w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water; w
- Intermittent — Int; i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CeA; FoB2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

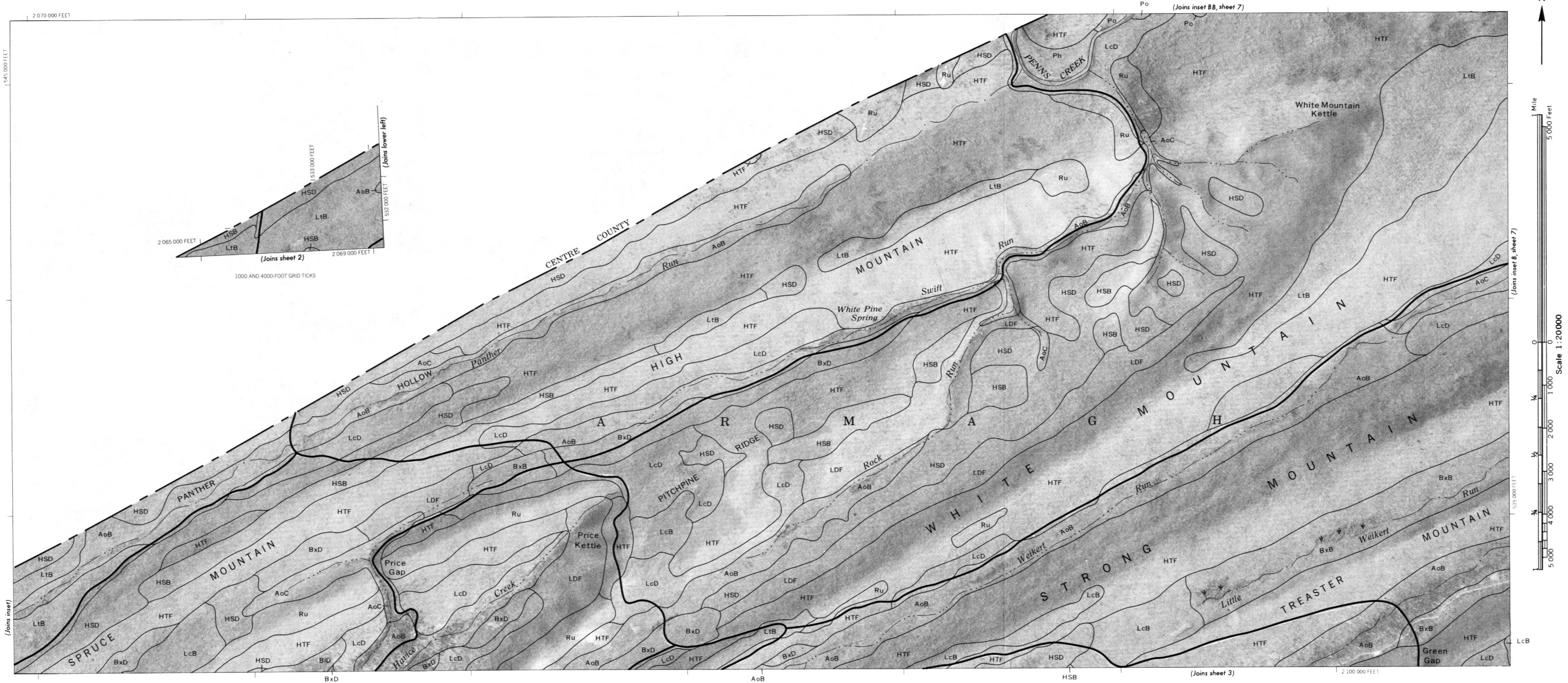
SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

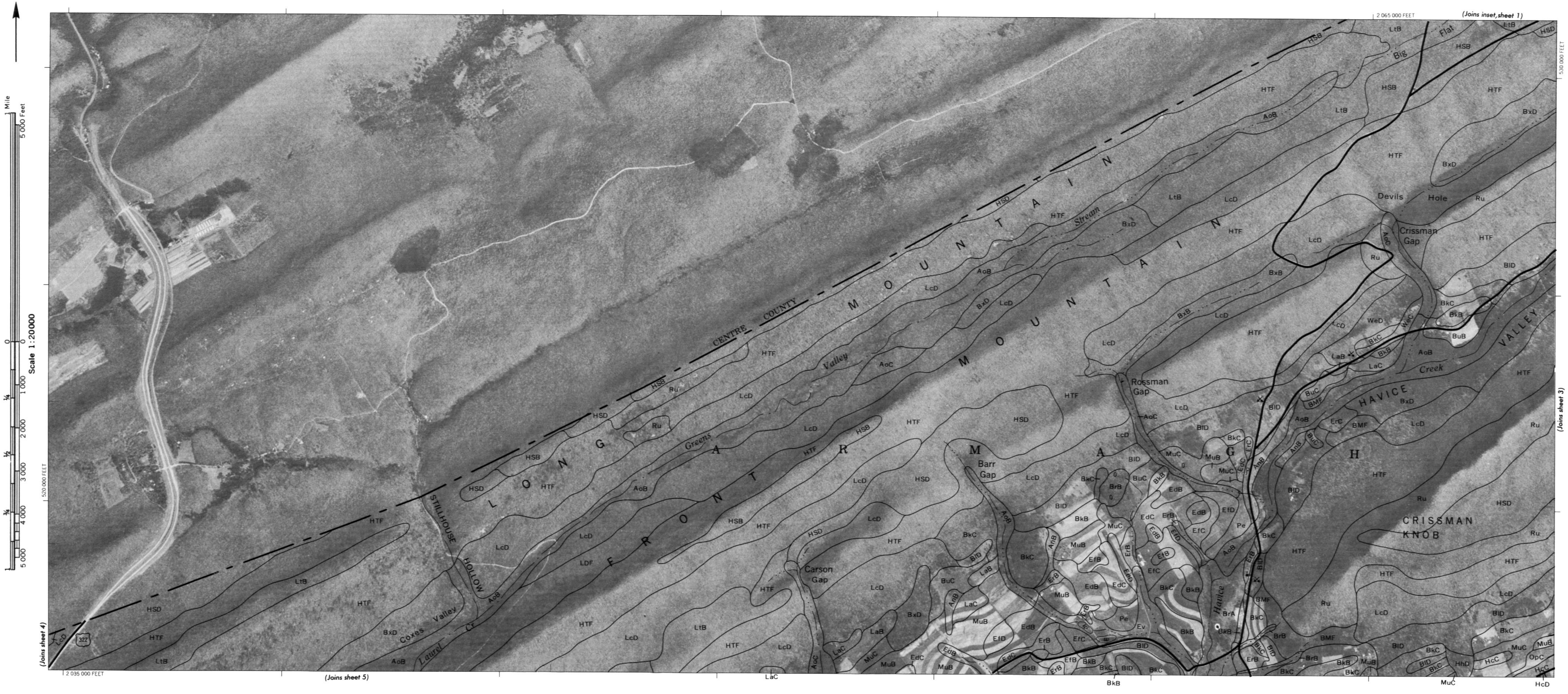
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot — 0
- Cut and Fill land — C.F.
- Industrial Waste-Slag Dump — INDUSTRIAL WASTE

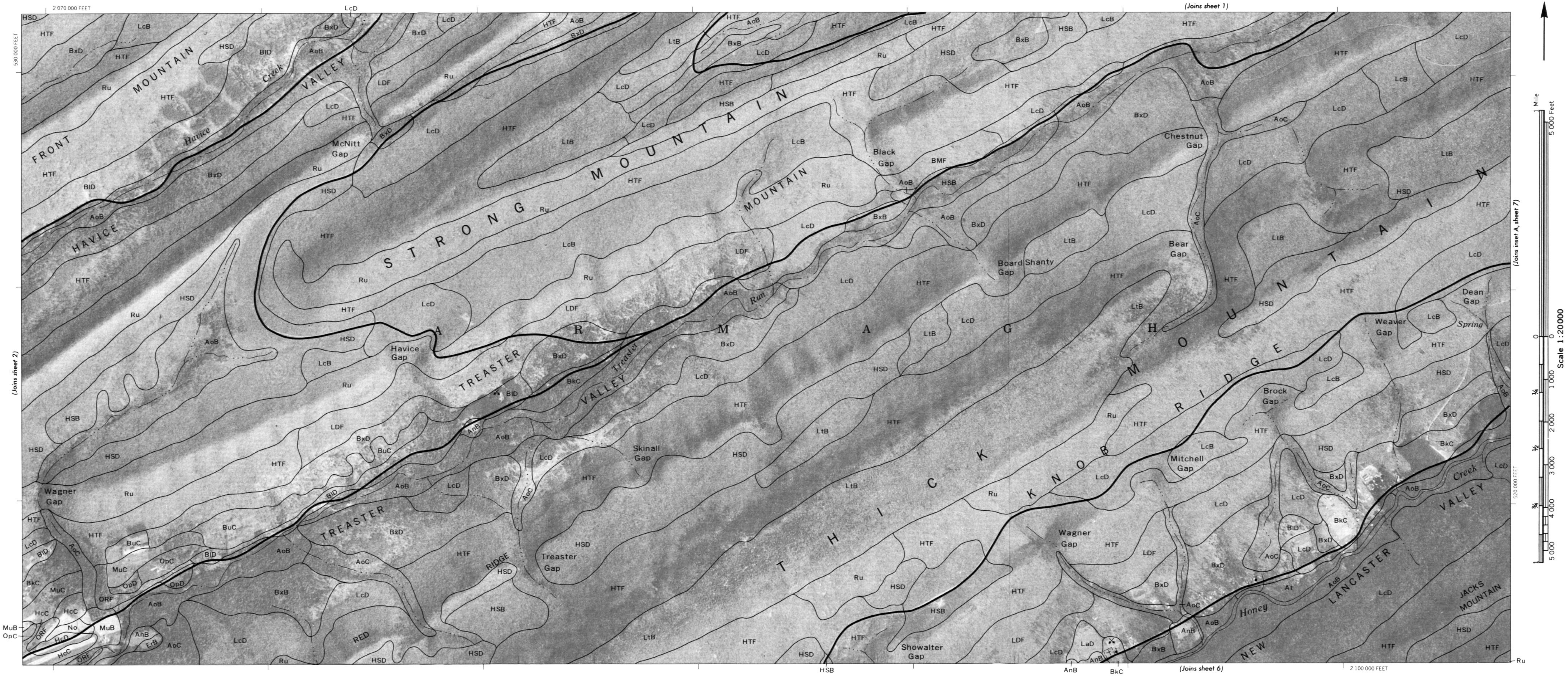
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 1

1



2


N
1 Mile
5 000 Feet
Scale 1:20000
(Joins inset, sheet 1)
(Joins sheet 3)
(Joins sheet 4)
(Joins sheet 5)
2 065 000 FEET
530 000 FEET
520 000 FEET
2 035 000 FEET
CENTRE COUNTY
LONG MOUNTAIN
FRONT MOUNTAIN
Stream Valley
Greens Valley
STILLHOUSE HOLLOW
Coxes Valley
Laurel Cr.
Carson Gap
Barr Gap
Rossman Gap
Crissman Gap
Devils Hole
Big Flat
HAVICE VALLEY
Havice Creek
CRISSMAN KNOB
322


3
N
(Joins sheet 1)
(Joins sheet 2)
(Joins inset A, sheet 7)
(Joins sheet 6)
2 070 000 FEET
2 100 000 FEET
530 000 FEET
520 000 FEET
FRONT MOUNTAIN
HAVICE MOUNTAIN
Havice Creek
VALLEY
McNitt Gap
STRONG MOUNTAIN
MOUNTAIN
Black Gap
Havice Gap
ARMAGH MOUNTAIN
TREASTER VALLEY
Treaster Run
Board Shanty Gap
Chestnut Gap
Bear Gap
Dean Gap
Weaver Gap
Spring
Skinall Gap
Wagner Gap
TREASTER RIDGE
Treaster Gap
RED
THICK KNOB RIDGE
Brock Gap
Mitchell Gap
Wagner Gap
Showalter Gap
Honey Creek
NEW LANCASTER VALLEY
JACKS MOUNTAIN
Scale 1:20000
1 Mile
5 000 Feet
0
1/4
1/2
3/4
1 000
2 000
3 000
4 000
5 000


4
N
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 5)
(Joins sheet 8)
2 055 000 FEET
2 030 000 FEET
2 035 000 FEET
2 020 000 FEET
515 000 FEET
505 000 FEET
375 000 FEET
365 000 FEET
East Waterford
TUSCARORA CREEK
DUNCAN HOLLOW
SMITH HOLLOW
TUSCARORA
TUSCARORA MOUNTAIN
Little Gap
Winns Gap
L A C K
Bear Pond
EAST WATERFORD NARROWS
PERRY COUNTY
CENTRE COUNTY
HUNTINGDON COUNTY
BROAD MOUNTAIN
A R M A G H
Muttersbaugh Gap
COXES VALLEY
Laurel Creek Reservoir
Laurel Creek
RIDGE
SPRUCE
LITTLE
MOUNTAIN
Spruce Gap
BRUSH
Lingle Creek
75
322

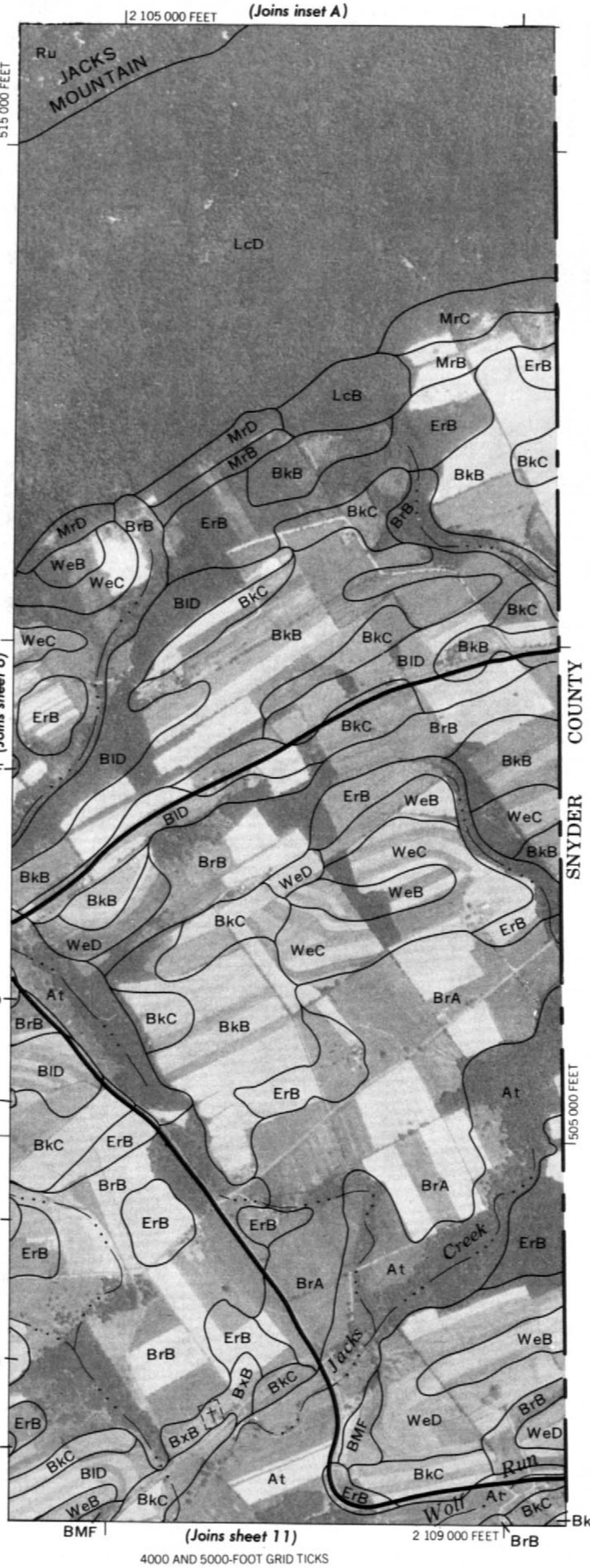

N
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 9)
2 035 000 FEET
515 000 FEET
505 000 FEET
2 065 000 FEET
LONG
COXES
VALLEY
MOUNTAIN
Laurel
Creek
FRONT
MOUNTAIN
STILLHOUSE
HOLLOW
Short Drive
Gap
Mt Pleasant
LITTLE
MOUNTAIN
POTLICKER
FLATS
Lingle
Creek
Laurel
SAND
HOLE
RIDGE
Straley
Knob
Creek
MILROY
CONRAIL
QUARRY
water
K
A
R
M
A
G
H
Siglerville
Creek
Havice
Creek
Knobville
TREASTER
VALLEY
Beatty
Knob
Locke Mills
NEW
LANCASTER
Honey
Creek
VALLEY
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000

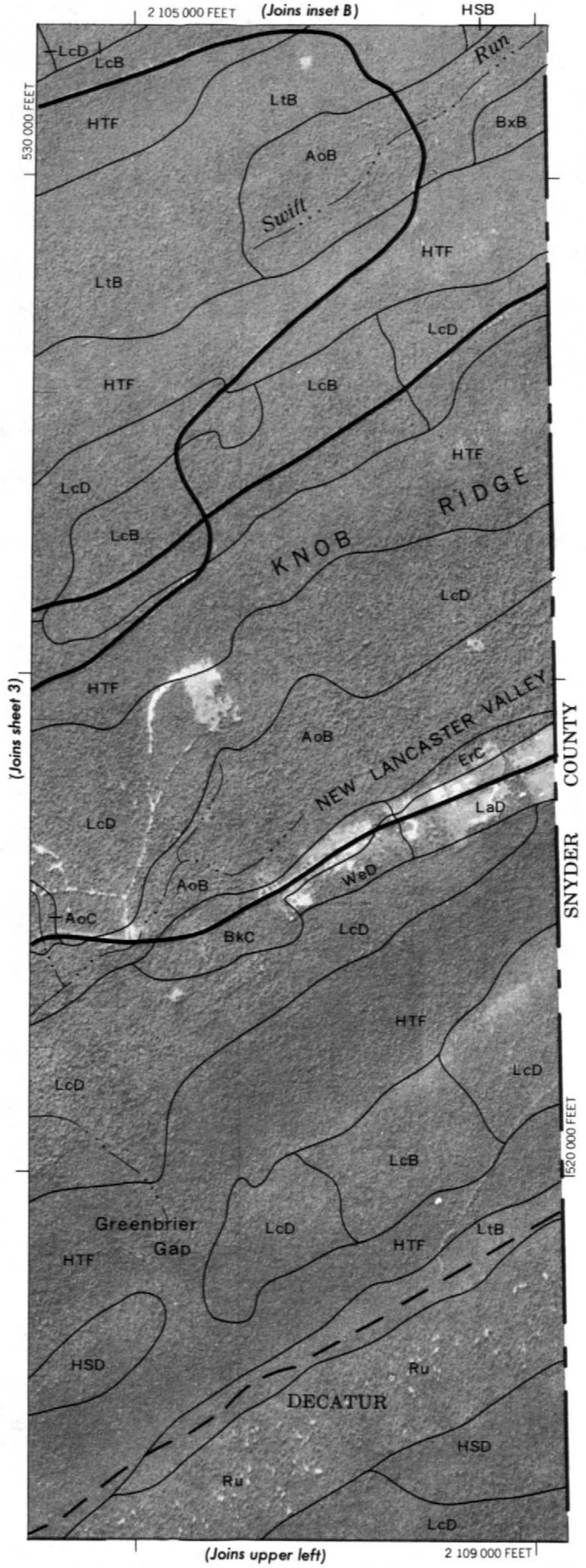
6


N
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 10)
2 100 000 FEET
2 070 000 FEET
515 000 FEET
505 000 FEET
TREASTER VALLEY
RED RIDGE
THICK MOUNTAIN
HIGH TOP
ARMAGH RIDGE
KNOB
Aitkin Gap
Beatty Knob
Reeds Gap
Kearns Gap
Peters Gap
Belltown Gap
Belltown
REEDS GAP STATE PARK
HONEY
CREEK
Honey
Creek
NEW LANCASTER VALLEY
JACKS MOUNTAIN
DECATUR

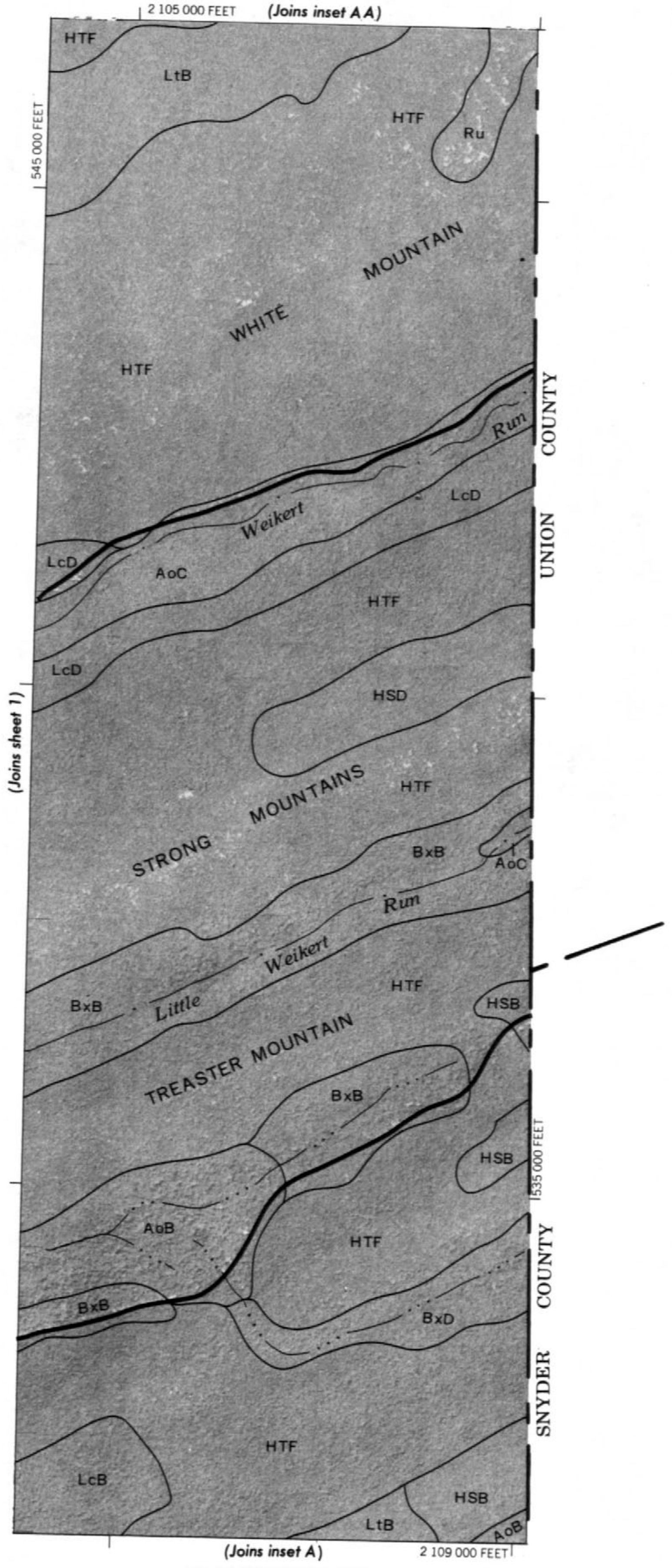
7

N



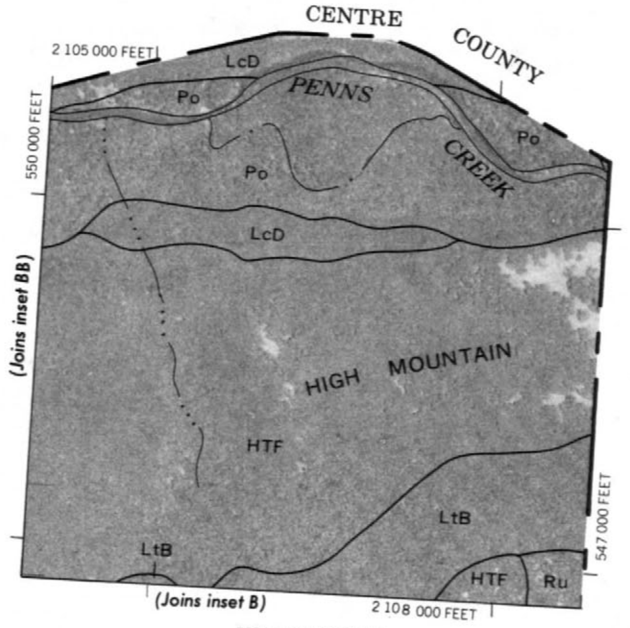


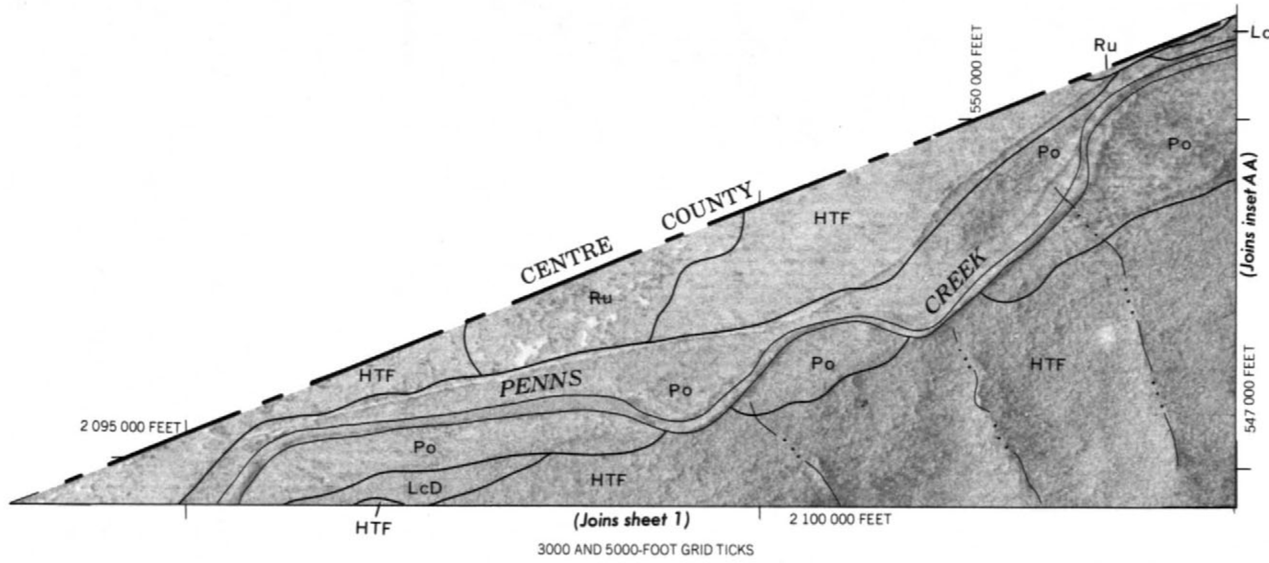
INSET A



INSET B

INSET AA





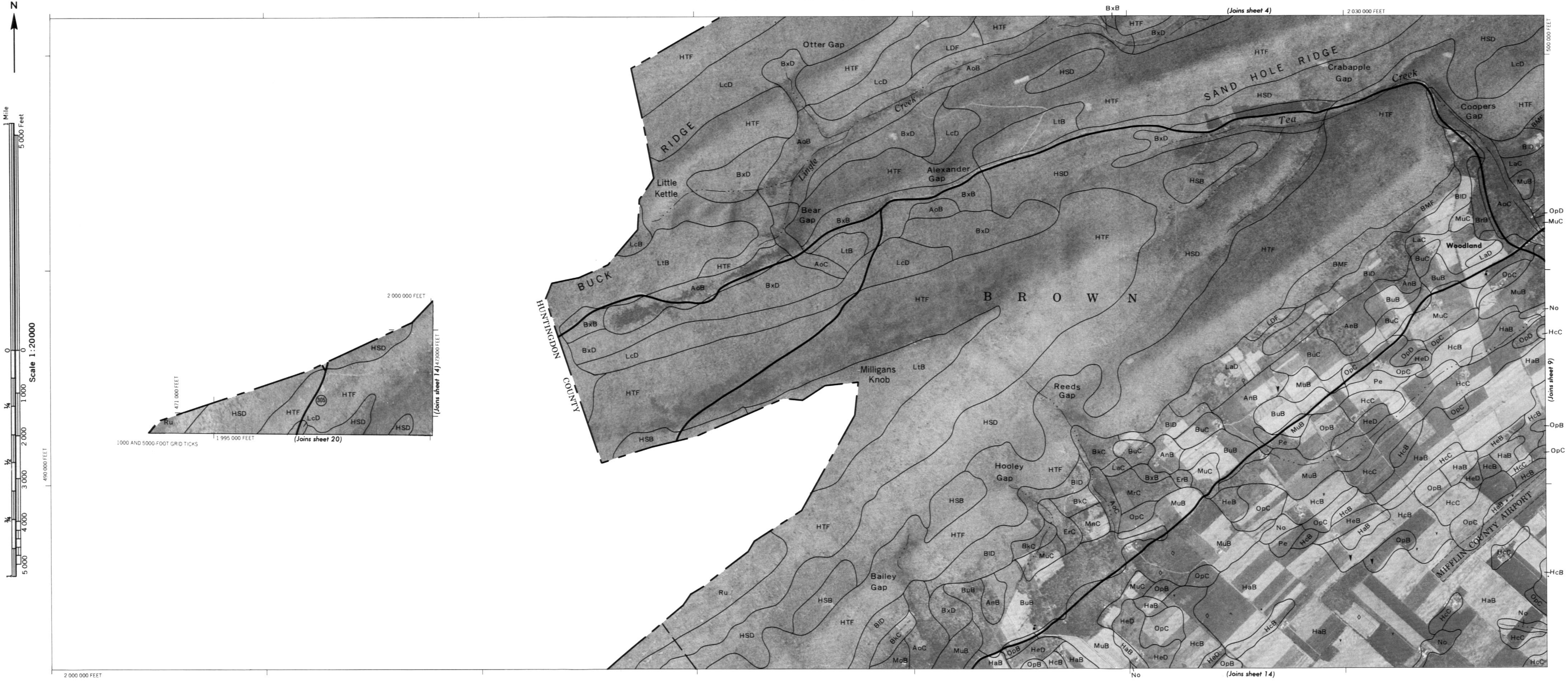
INSET BB

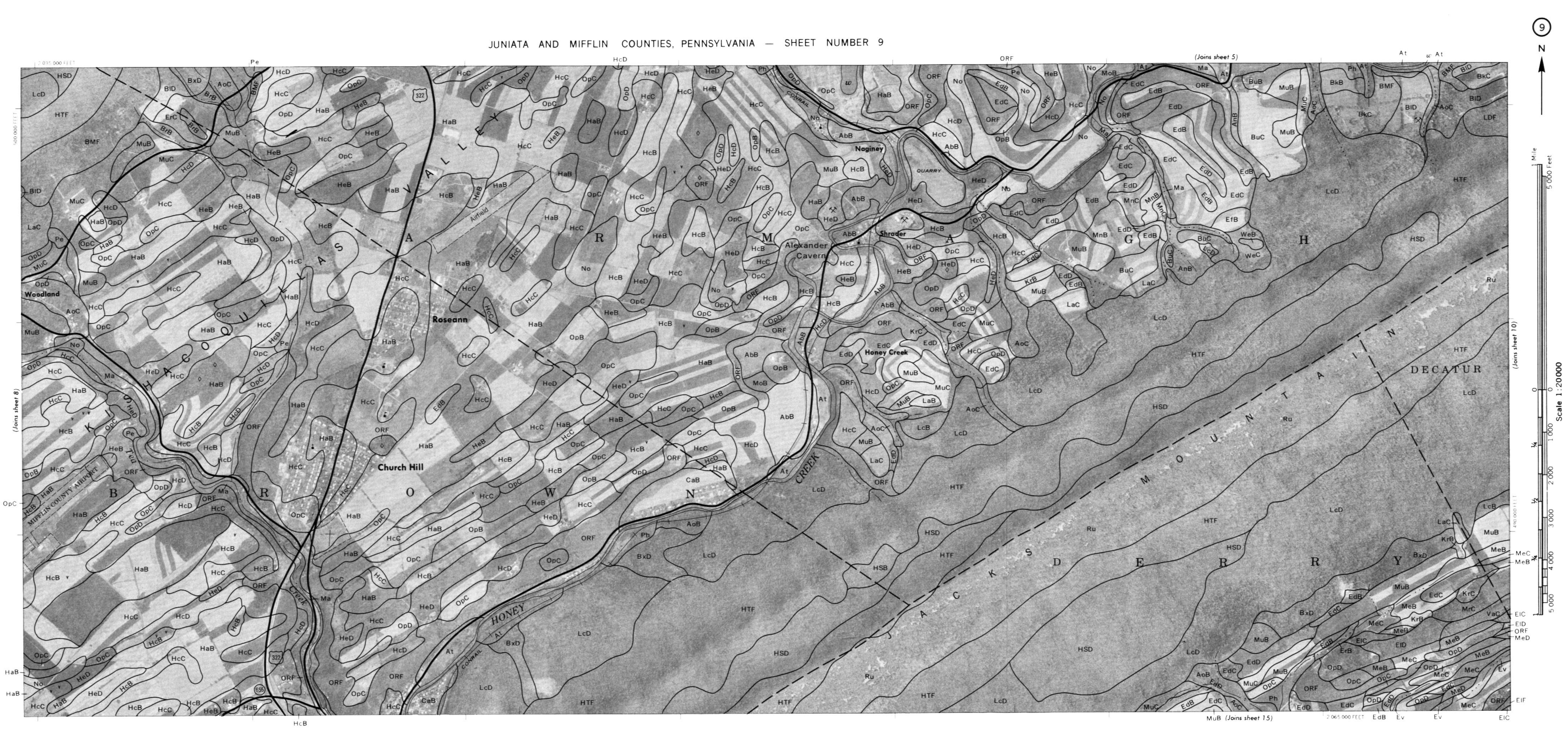
Scale 1:20000

1 Mile — ¾ — ½ — ¼ — 0

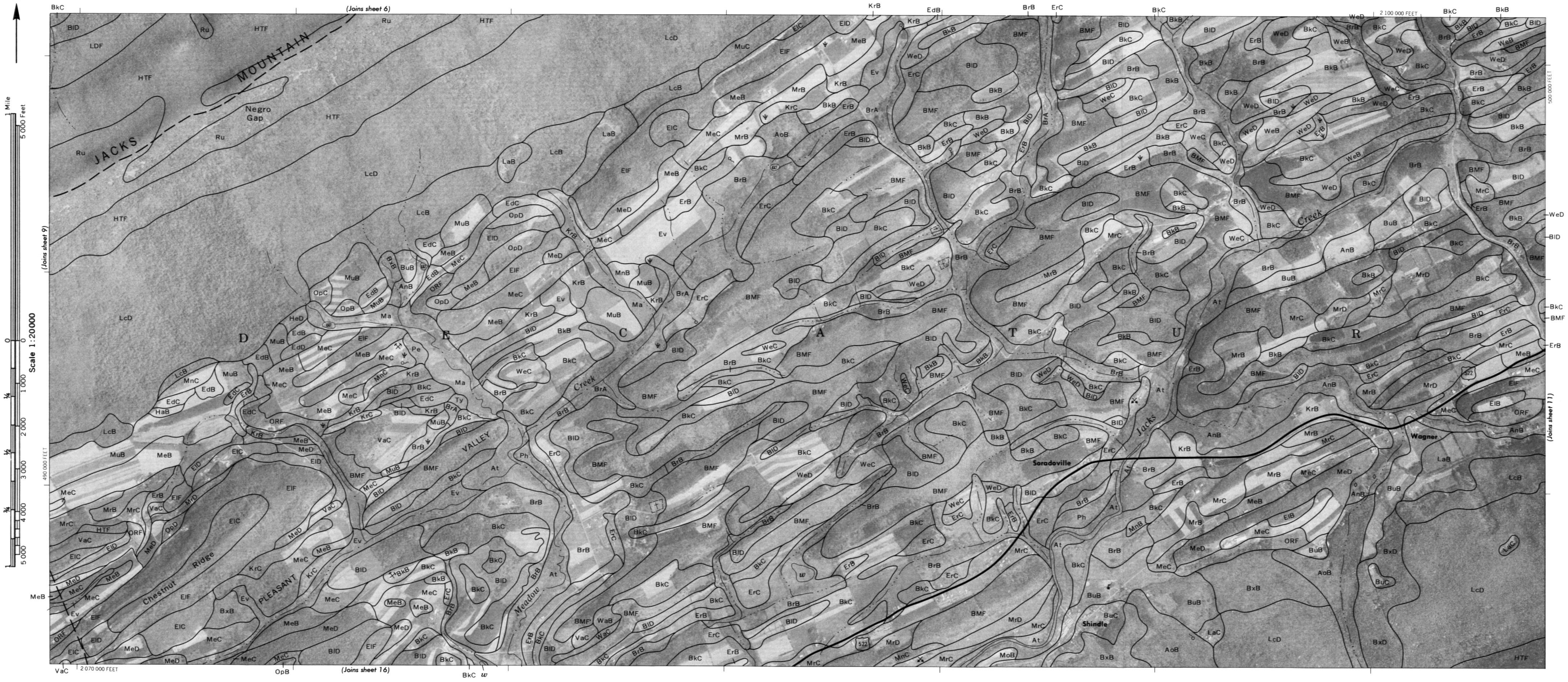
5 000 Feet — 4 000 — 3 000 — 2 000 — 1 000 — 0 — 5 000

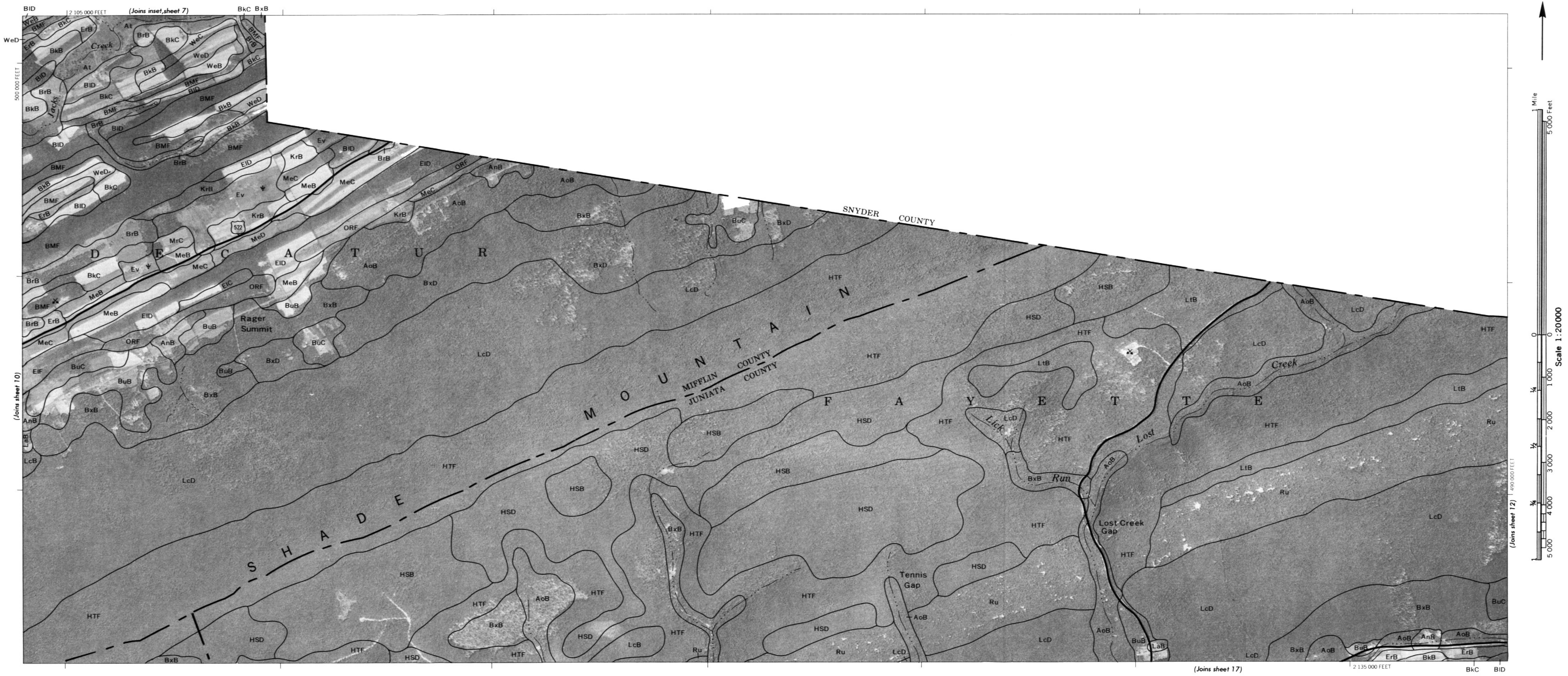
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 8



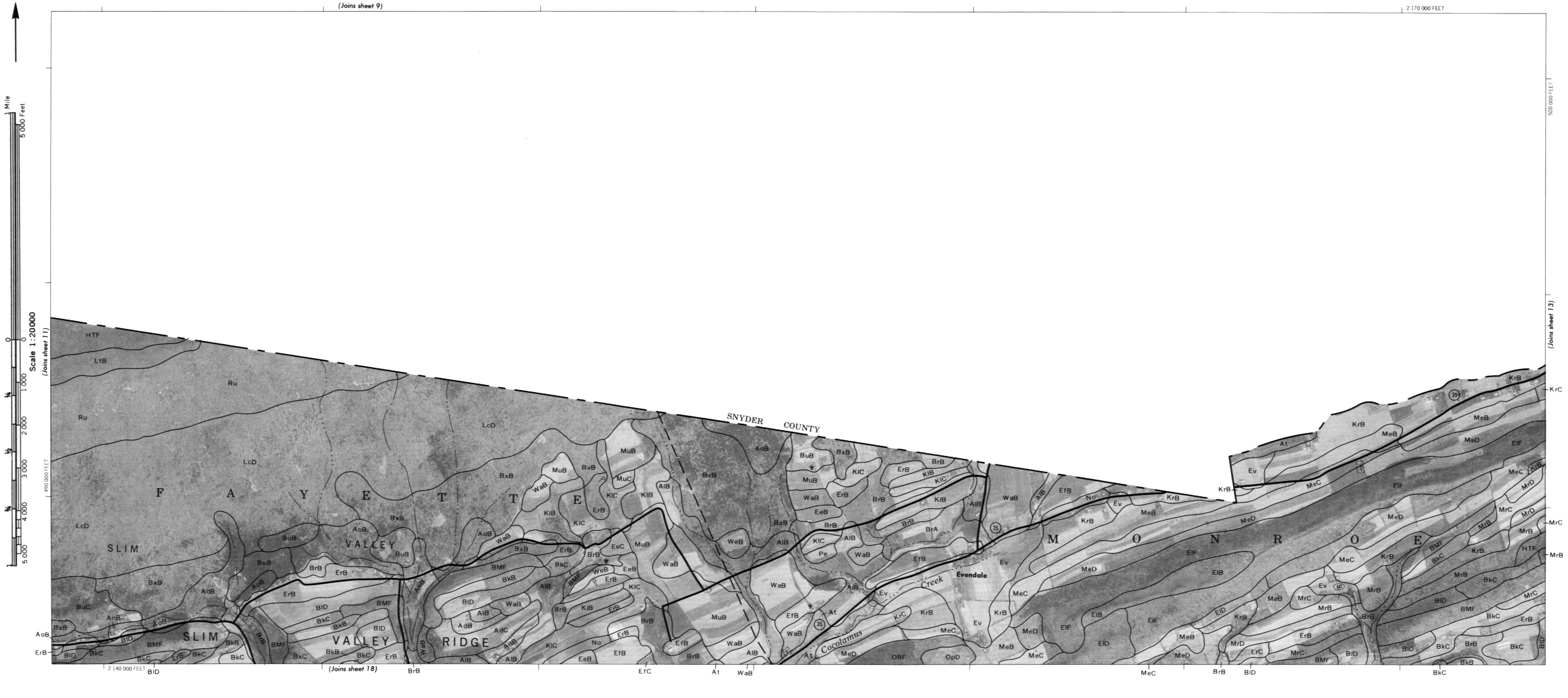

9
N
(Joins sheet 5)
(Joins sheet 8)
(Joins sheet 10)
MuB (Joins sheet 15)
Woodland
Roseann
Church Hill
MIFFLIN COUNTY AIRPORT
Airfield
Noginey
Alexander Cavern
Shrader
Honey Creek
QUARRY
CONRAIL
HONEY
CREEK
Creek
Tea
322
655
KISHACOQUILLAS VALLEY
BROWN
ARMAGH
JACKS MOUNTAIN
DECATUR
DERRY
2 035 000 FEET
2 065 000 FEET
500 000 FEET
490 000 FEET
1 Mile
5 000 Feet
Scale 1:20000
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 10





(Joins inset, sheet 7)
2 105 000 FEET
500 000 FEET
490 000 FEET
2 135 000 FEET
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 17)
SNYDER COUNTY
MIFFLIN COUNTY
JUNIATA COUNTY
DECATUR
FAYETTE
SHADE MOUNTAIN
Rager Summit
Lost Creek Gap
Tennis Gap
Jacks Creek
Lick Run
Lost Creek
522
BlD
BkC
BxB
WeD
N
11
Scale 1:20000
1 Mile
5 000 Feet


N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 9)
2 170 000 FEET
500 000 FEET
(Joins sheet 13)
(Joins sheet 11)
490 000 FEET
2 140 000 FEET
(Joins sheet 18)
SNYDER COUNTY
F A Y E T T E
M O N R O E
SLIM VALLEY
SLIM VALLEY RIDGE
Evendale
Cocolamus Creek
HTF
LtB
Ru
LcD
BxB
MuB
WaB
KlC
AoB
BuB
ErB
BlD
BkC
BMF
AlB
MeC
MeD
ElF
KrB
KrC
MrC
MrB
Ev
At
EfB
EfC
OpD
ORF

3000 AND 5000 FOOT GRID TICKS

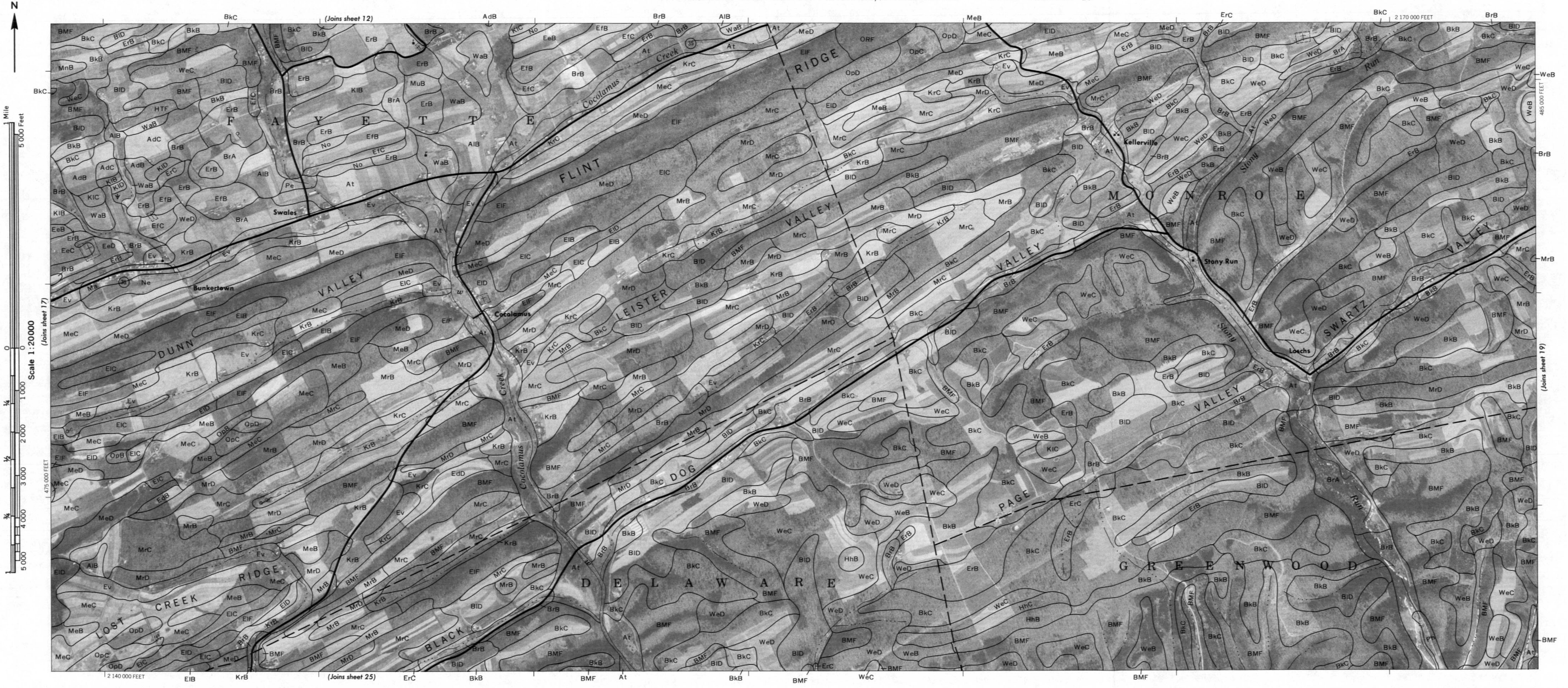
14


N
Scale 1:20000
(Joins sheet 8)
(Joins sheet 15)
(Joins sheet 21)
(Joins inset, sheet 8)
2 000 000 FEET
2 030 000 FEET
475 000 FEET
485 000 FEET
HUNTINGDON COUNTY
STRONG MOUNTAIN
Polyann Gap
HARTZLER HOLLOW
CAMPBELL HOLLOW
Smith Gap
UNION
KISHACOQUILLAS
BROWN VALLEY
Barrville
Cedar Hill
Kishacoquillas
Alexander Springs
FROG HOLLOW
KISHACOQUILLAS CREEK
Coffee Run
JACKS MOUNTAIN
Granville

Reedsville
Lumber City
Mann Narrows
BROWN
JACKS
MOUNTAIN
KISHACOQUILLAS
CREEK
YEAGERTOWN
BURNHAM
DERRY
VALLEY
DRY
INDUSTRIAL WASTE
JACKS CREEK RIDGE
Maitland
GRANVILLE
Buck Run
(Joins sheet 9)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 22)
2 035 000 FEET
485 000 FEET
475 000 FEET
2 065 000 FEET
N
Scale 1:20000
1 Mile
5 000 Feet

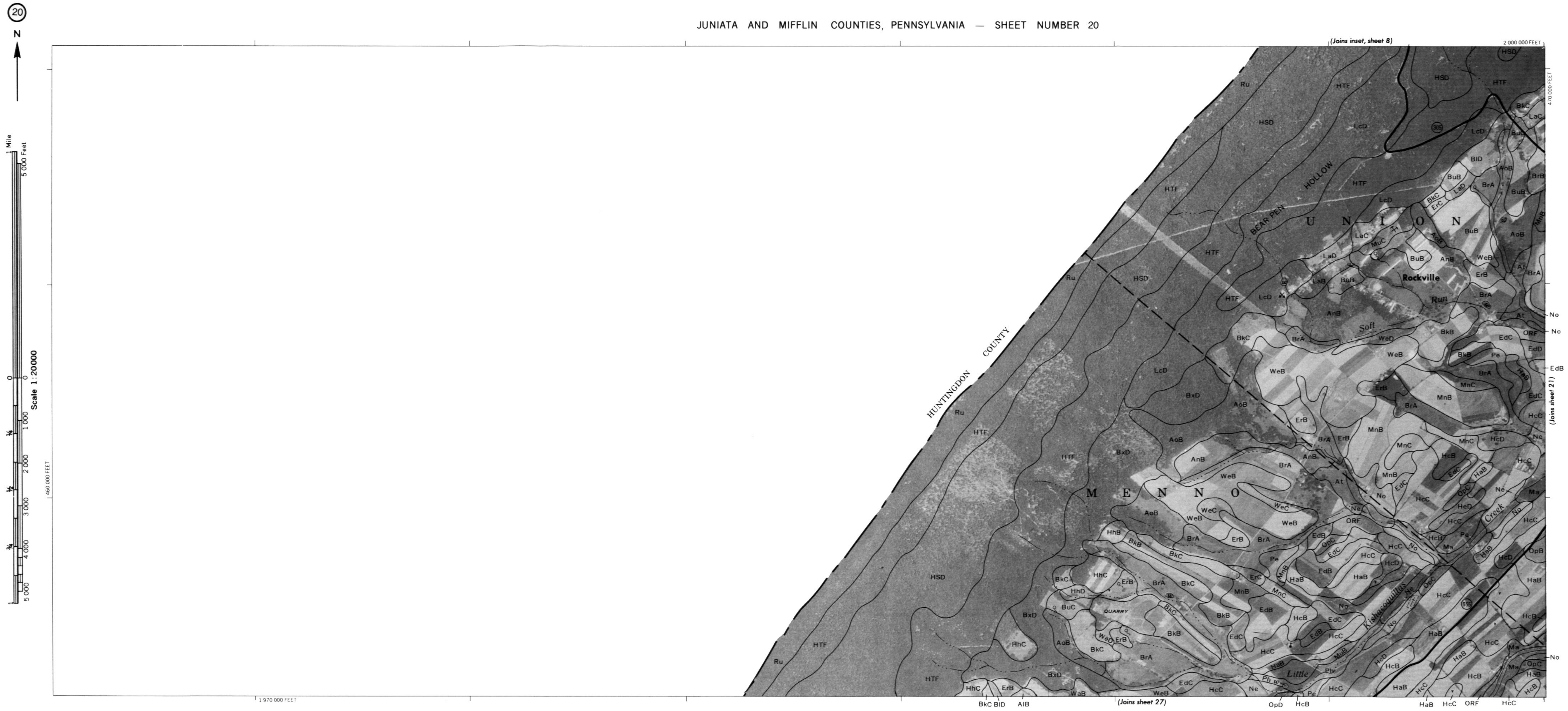
JUNIATA AND MIFFLIN COUNTIES PENNSYLVANIA — SHEET NUMBER 16

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 17

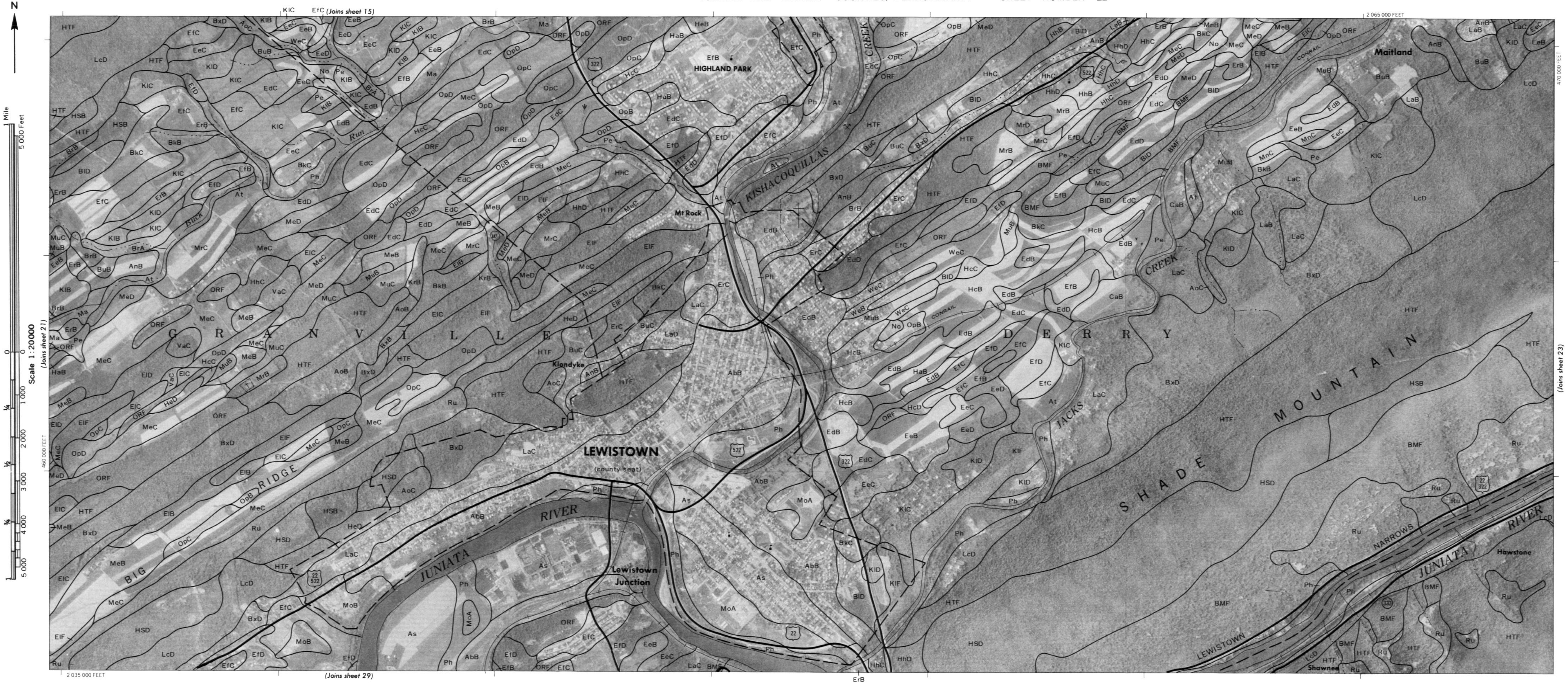

N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 12)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 25)
2 170 000 FEET
2 140 000 FEET
485 000 FEET
475 000 FEET
F A Y E T T E
M O N R O E
D E L A W A R E
G R E E N W O O D
FLINT RIDGE
LEISTER VALLEY
DUNN VALLEY
SWARTZ VALLEY
PAGE VALLEY
DOG VALLEY
BLACK
LOST CREEK RIDGE
Cocolamus Creek
Stony Run
Swales
Bunkertown
Cocolamus
Kellerville
Stony Run
Loschs
35


19
N
(Joins sheet 13)
(Joins sheet 18)
(Joins sheet 26)
(Joins inset, sheet 13)
SWARTZ VALLEY
Knousetown
MONROE
QUAKER VALLEY
DRESSLERS RIDGE
Quaker Run
West Branch
SNYDER COUNTY
Mahantango Creek
GREENWOOD
Cocolamus Run
SUSQUEHANNA
Leiningers Run
FRYMOYER RIDGE
Oriental
Dobson Run
2 175 000 FEET
2 205 000 FEET
485 000 FEET
475 000 FEET
Scale 1:20000
1 Mile
5 000 Feet

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 20

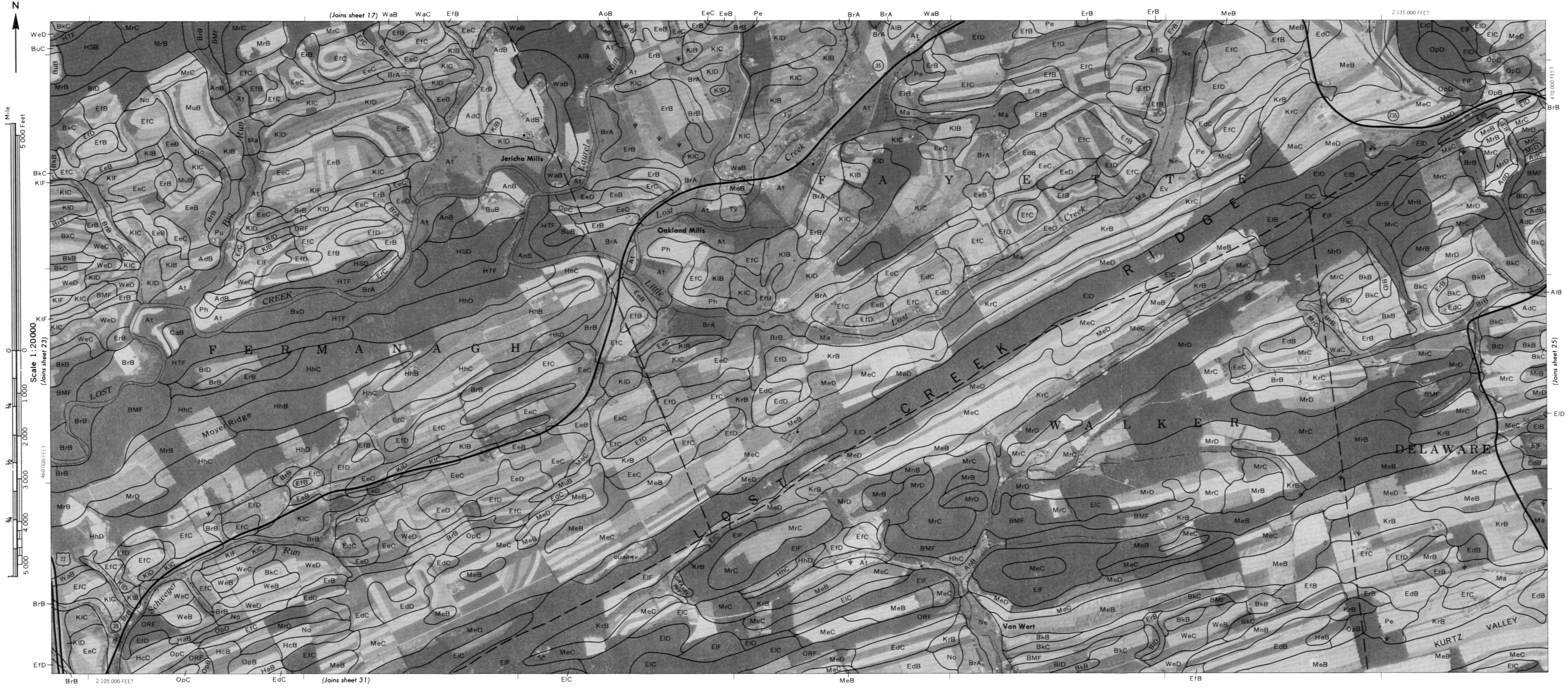



2 000 000 FEET
470 000 FEET
(Joins sheet 14)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 28)
460 000 FEET
2 030 000 FEET
BELLEVILLE
Union Mills
KISHACOQUILLAS VALLEY
UNION
BROWN
GRANVILLE
JACKS MOUNTAIN
Kishacoquillas Creek
Little Kishacoquillas Creek
Soft Run
N
Scale 1:20000
1 Mile
5 000 Feet


N
(Joins sheet 15)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 29)
Scale 1:20000
1 Mile
5 000 Feet
2 035 000 FEET
2 065 000 FEET
460 000 FEET
470 000 FEET
HIGHLAND PARK
Mt Rock
Maitland
KISHACOQUILLAS CREEK
Buck Run
G R A N V I L L E
D E R R Y
BIG RIDGE
SHADE MOUNTAIN
Klondyke
LEWISTOWN
(county seat)
JUNIATA RIVER
Lewistown Junction
JACKS CREEK
NARROWS
Hawstone
Shawnee
LEWISTOWN
CONRAIL

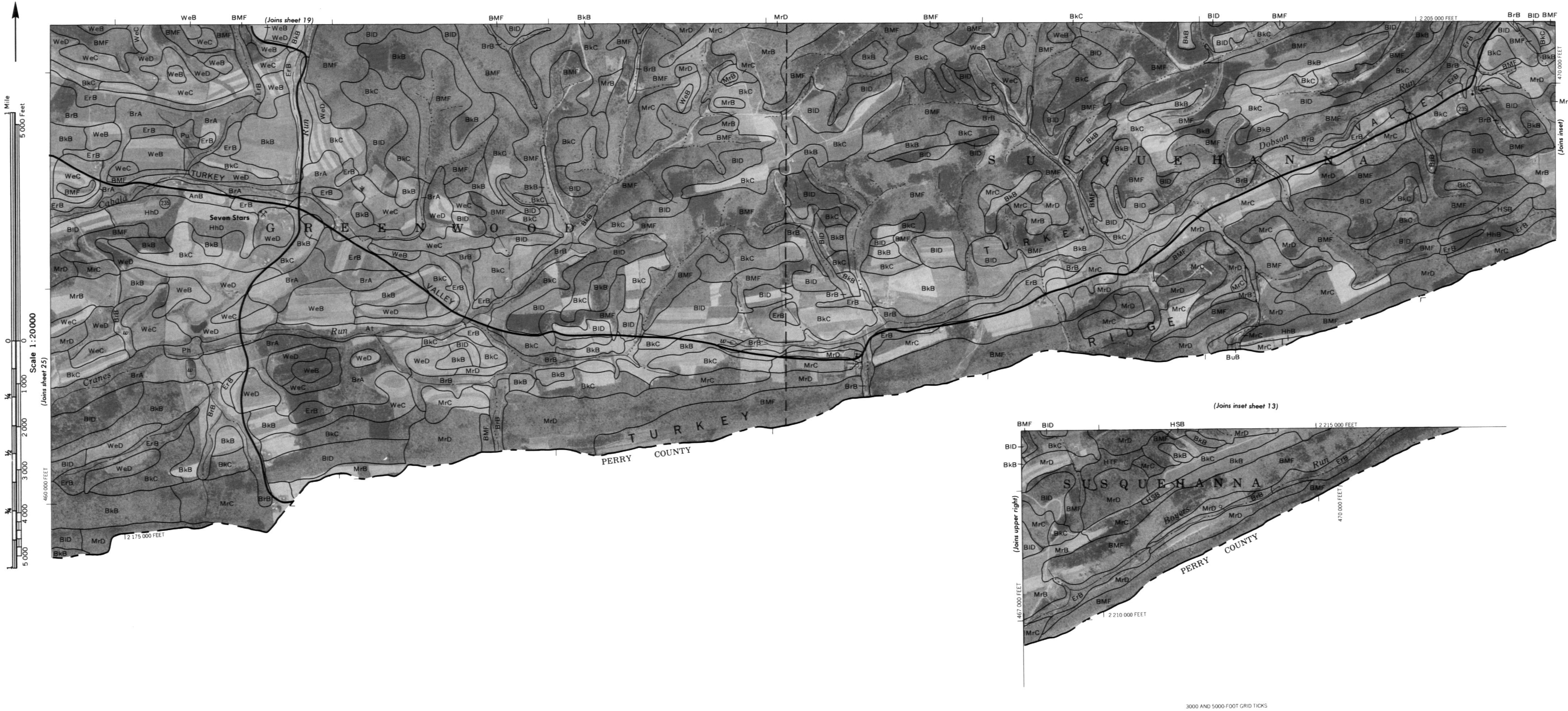

2 070 000 FEET
470 000 FEET
(Joins sheet 16)
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 30)
2 100 000 FEET
460 000 FEET
N
Scale 1:20000
DERRY
SHADE MOUNTAIN
MIFFLIN COUNTY
JUNIATA COUNTY
Roaring Run
Macedonia Gap
Macedonia Run
Macedonia
NARROWS
JUNIATA RIVER
LEWISTOWN
BLUE MOUNTAIN
Denholm
Hawstone
GRANVILLE
M I L F O R D
F E R M A N A G H
SLIM VALLEY
SLIM VALLEY RIDGE
Horning Run
Arch Rock
Sulouff Run
Lost Creek
Cuba Mills
Airfield
Muddy Run
Moyer Ridge

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 24




25
N
(Joins sheet 18)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 32)
2 140 000 FEET
470 000 FEET
460 000 FEET
2 170 000 FEET
FAYETTE
BLACK DOG VALLEY
East Salem
Delaware Creek
DELAWARE
Cocolamus Creek
Maze
TURKEY VALLEY
GREENWOOD RIDGE
SHELLYS
Stony Run
Cranes Run
Dutchman Run
Goodville
KURTZ VALLEY
WHITE OAK HOLLOW
EVANS HOLLOW
PERRY COUNTY
Scale 1:20000
Mile
5 000 Feet

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 26



N
1 970 000 FEET
455 000 FEET
445 000 FEET
2 000 000 FEET
(Joins sheet 20)
(Joins sheet 28)
(Joins sheet 33)
HUNTINGDON COUNTY
KINGS HOLLOW
Hostetler Gap
KISHACOQUILLAS VALLEY
MENNO
Menno
OLIVER
Kishacoquillas Creek
Scale 1:20000
1 Mile
5 000 Feet

28

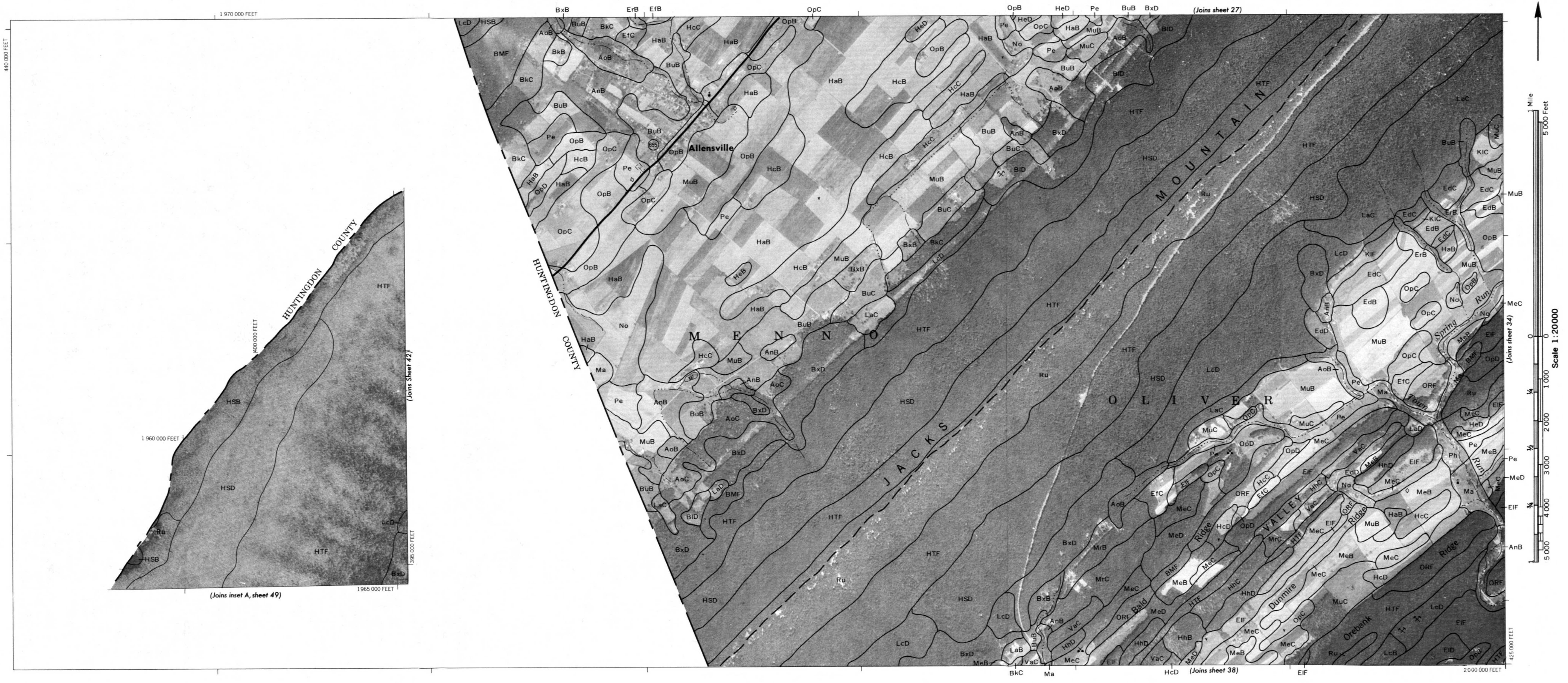
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 28


2 035 000 FEET
455 000 FEET
(Joins sheet 22)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 35)
2 065 000 FEET
445 000 FEET
N
Colonial Hills
Granville
Fairview
JUNIATA RIVER
CONRAIL
Granville Run
G R A N V I L L E
BLUE MOUNTAIN
Bixler Gap
MIFFLIN COUNTY
JUNIATA COUNTY
East Licking Creek
water
1 Mile
5 000 Feet
Scale 1:20000

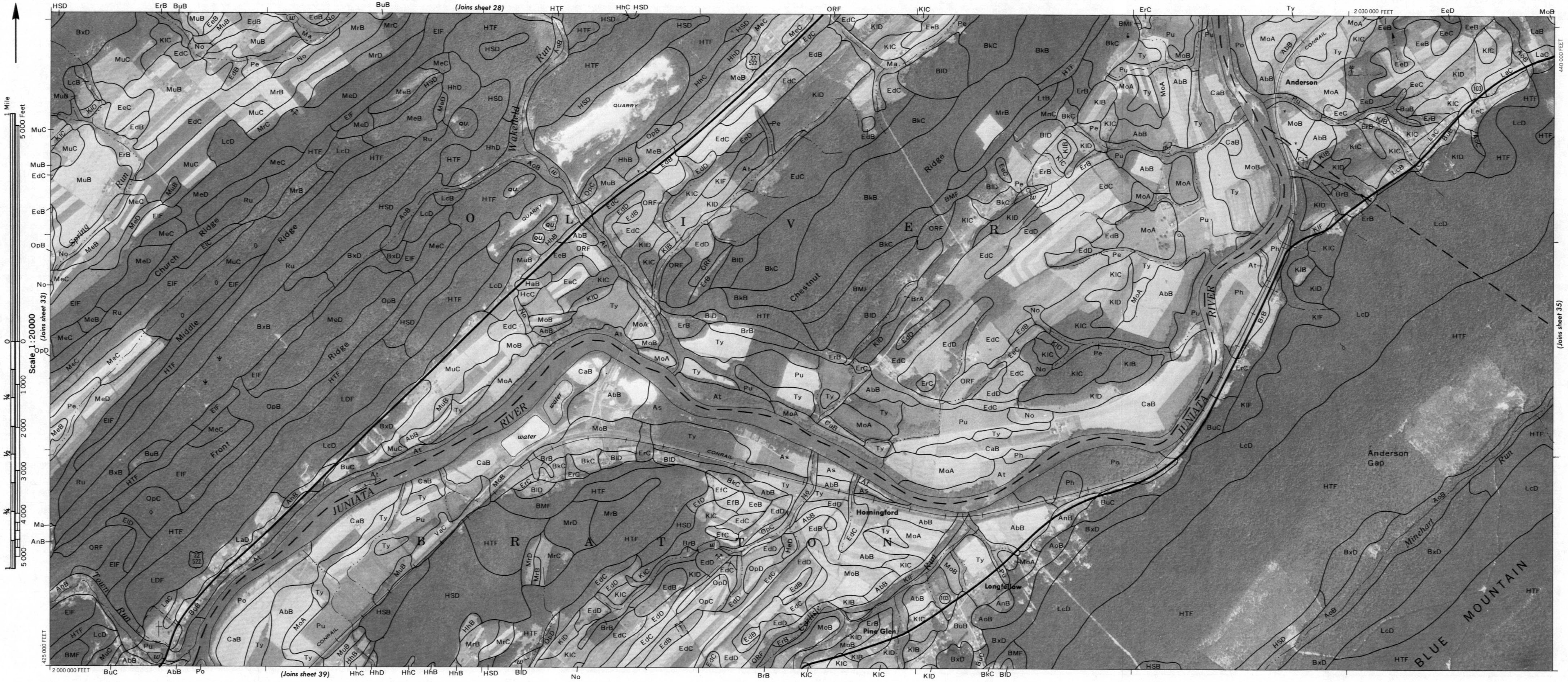
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 30


31
N
(Joins sheet 24)
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 37)
2 105 000 FEET
2 135 000 FEET
455 000 FEET
445 000 FEET
LOST CREEK RIDGE
WALKER
DELAWARE
JUNIATA RIVER
Schweyer Run
Cedar Run
Spring Run
Doe Run
Locust Run
Centre
CONRAIL
Scale 1:20 000
Mile
Feet
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000


N
(Joins sheet 25)
(Joins sheet 31)
(Joins inset)
(Joins lower left)
(Joins inset, sheet 37)
Scale 1:20000
1 Mile
5 000 Feet
2 140 000 FEET
2 145 000 FEET
2 170 000 FEET
455 000 FEET
445 000 FEET
440 000 FEET
438 000 FEET
DELAWARE
JUNIATA
RIVER
Thompsontown
Thompsontown Station
Durward Station
LOCK HOLLOW
EVANS HOLLOW
PLATTE HOLLOW
Delaware Creek
PERRY COUNTY
TUSCARORA
MOUNTAIN
RIDGE
CONRAIL
2000 AND 5000-FOOT GRID TICKS

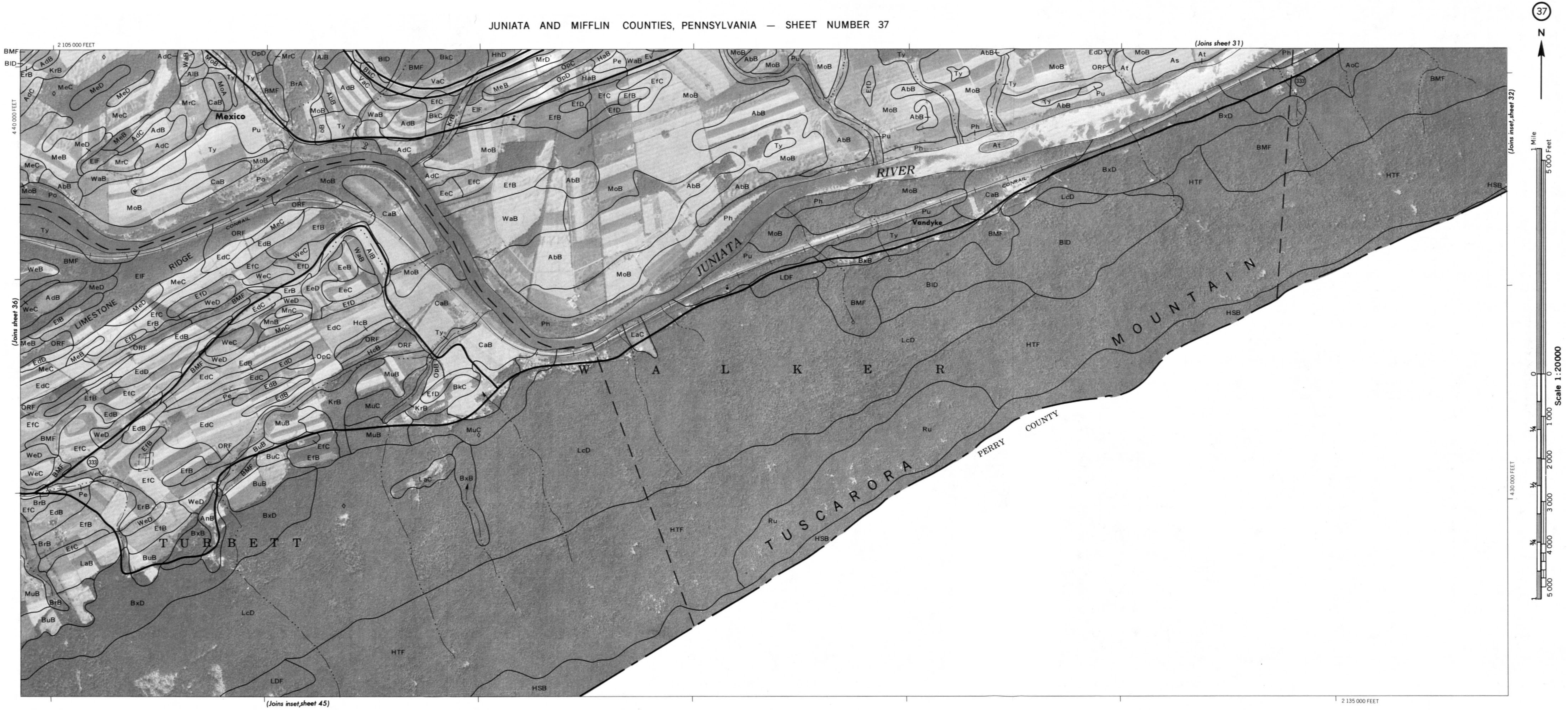

N
(Joins sheet 27)
(Joins sheet 34)
(Joins sheet 38)
(Joins sheet 42)
(Joins inset A, sheet 49)
1 970 000 FEET
440 000 FEET
400 000 FEET
1 960 000 FEET
395 000 FEET
1 965 000 FEET
425 000 FEET
2 000 000 FEET
Allensville
HUNTINGDON COUNTY
M E N N O
O L I V E R
JACKS MOUNTAIN
Bald Ridge
Dunmire Ridge
Orebank Ridge
VALLEY
Spring Run
Town Run
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 34




35
N
(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 40)
2 035 000 FEET
2 065 000 FEET
440 000 FEET
430 000 FEET
BLUE MOUNTAIN
MIFFLIN COUNTY
JUNIATA COUNTY
MILFORD
SHADE MOUNTAIN
BLACKLOG MOUNTAIN
BRATTON
TUSCARORA
BEALE
HERRINGBONE RIDGES
Nook
Minehart Run
Licking Creek
East Licking
Spectacle Run
Scale 1:20000
1 Mile
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 36



N
(Joins sheet 31)
(Joins sheet 36)
(Joins inset, sheet 32)
(Joins inset, sheet 45)
2 105 000 FEET
2 135 000 FEET
440 000 FEET
430 000 FEET
Mexico
Vandyke
JUNIATA RIVER
LIMESTONE RIDGE
CONRAIL
WALKER
TURBETT
TUSCARORA MOUNTAIN
PERRY COUNTY
333
Scale 1:20000
1 Mile
0
¼
½
¾
5 000 Feet
0
1 000
2 000
3 000
4 000
5 000

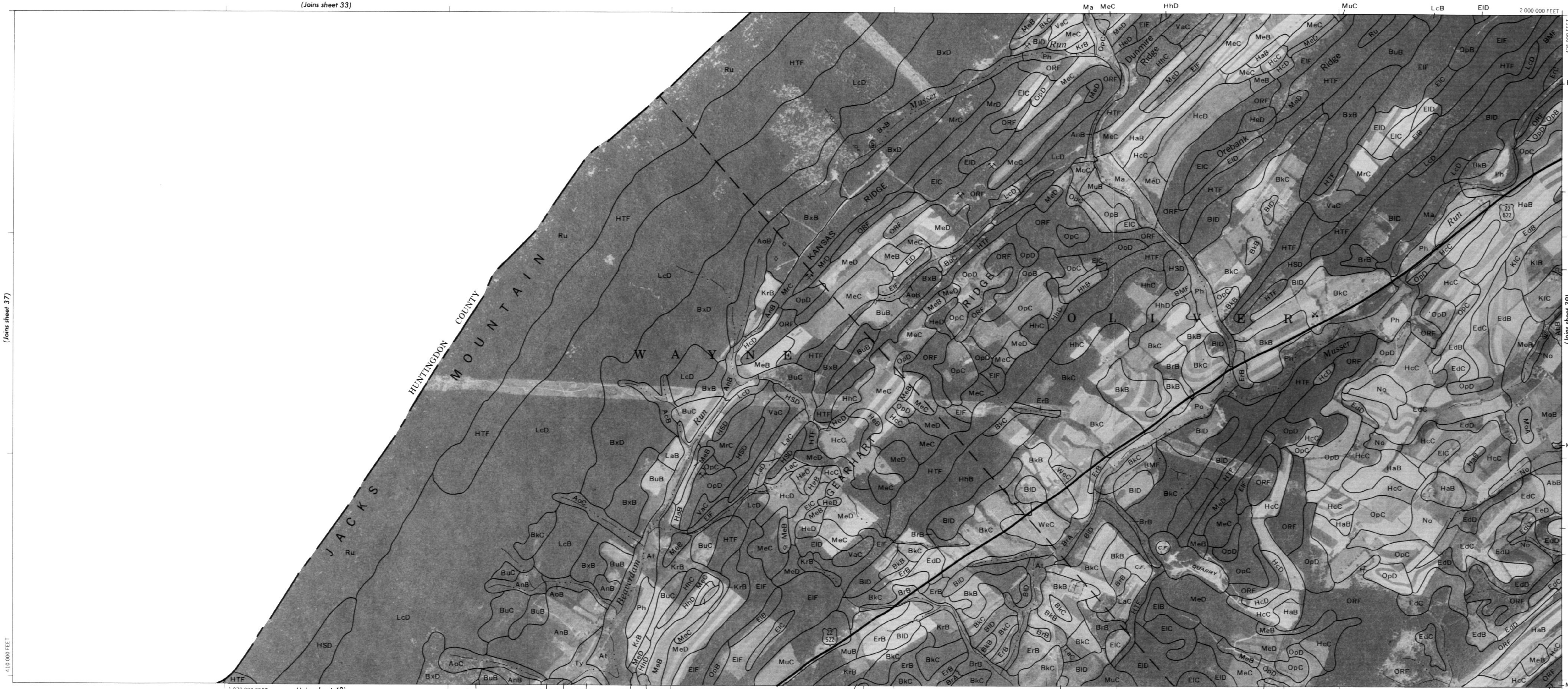
38

N

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 38

(Joins sheet 33)

(Joins sheet 37)



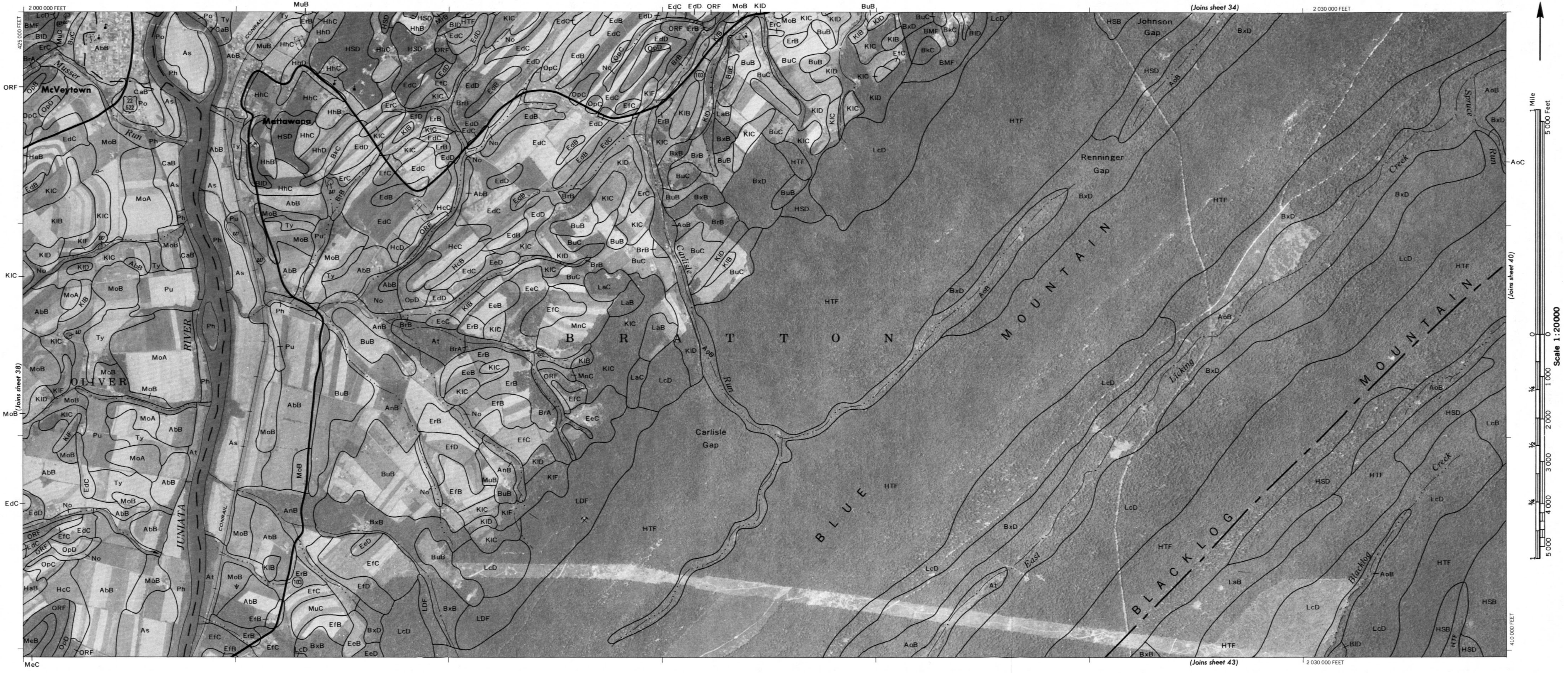
(Joins sheet 39)

(Joins sheet 42)

Scale 1:20000

0 ¼ ½ ¾ 1 Mile

0 1 000 2 000 3 000 4 000 5 000 Feet


(Joins sheet 34)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 43)
2 000 000 FEET
2 030 000 FEET
425 000 FEET
410 000 FEET
McVeytown
Mattawana
Musser Run
JUNIATA RIVER
CONRAIL
OLIVER
BRATTON
Carlisle Run
Carlisle Gap
Johnson Gap
Renninger Gap
BLUE MOUNTAIN
BLACKLOG MOUNTAIN
Licking Creek
East Licking Creek
Blacklog Creek
Spruce Run
N
Scale 1:20000
1 Mile
5 000 Feet

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 40


(Joins sheet 36)
(Joins sheet 40)
(Joins inset, sheet 45)
(Joins sheet 45)
2 070 000 FEET
2 100 000 FEET
425 000 FEET
410 000 FEET
BEALE
Academia
TUSCARORA
CREEK
LIMESTONE
RIDGE
Spruce Hill
Seven Pines
SPRUCE HILL
TURBETT
Hunters
Creek
Jinnie
Gap
Run
PERRY COUNTY
N
1 Mile
5 000 Feet
Scale 1:20000

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 42

N

Scale 1:20000

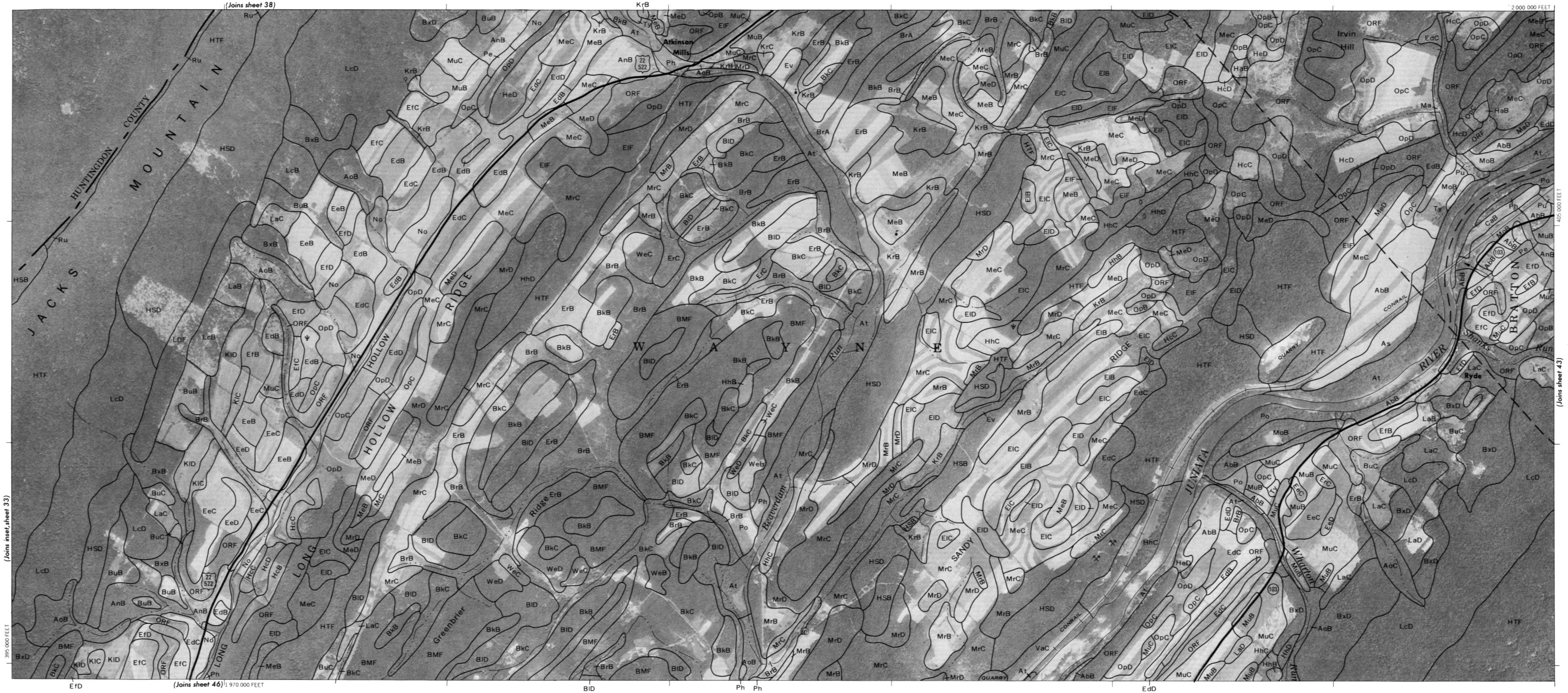
1 Mile

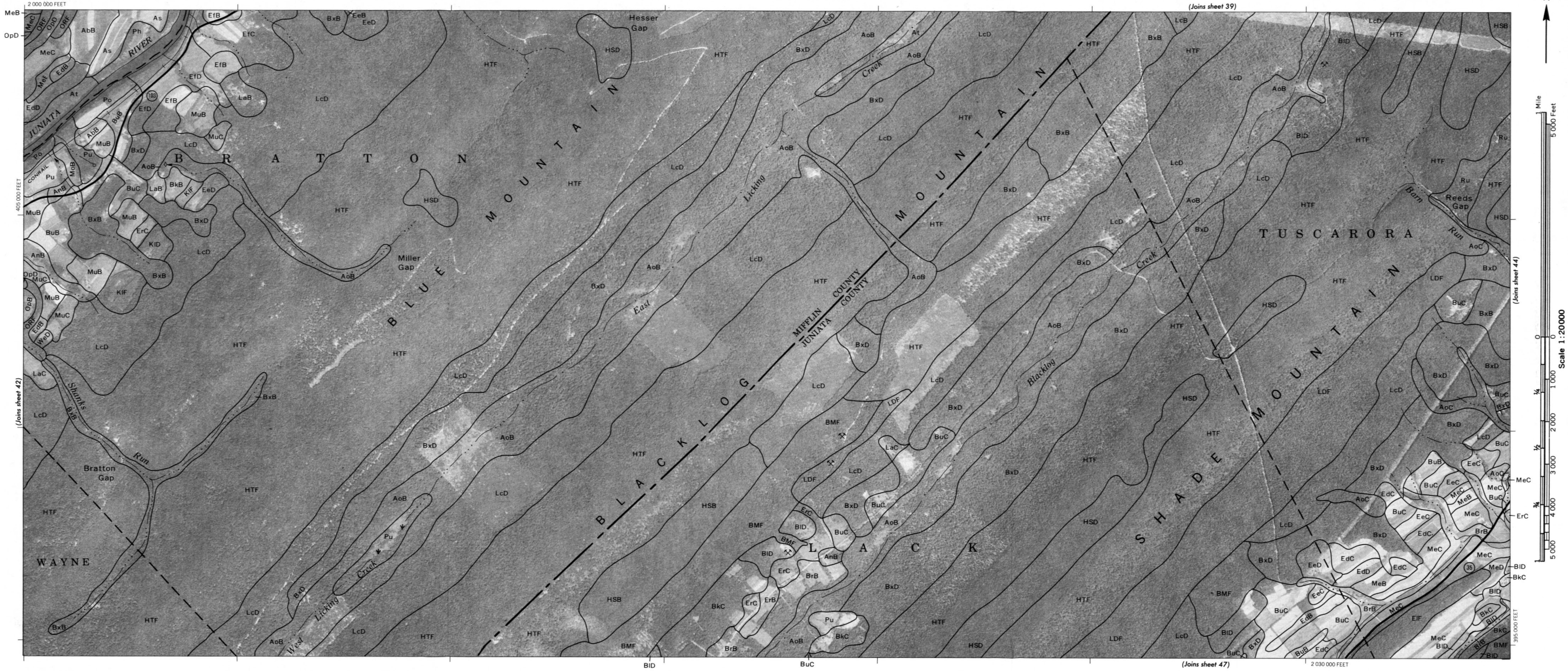
5 000 Feet

0 ¼ ½ ¾ 1

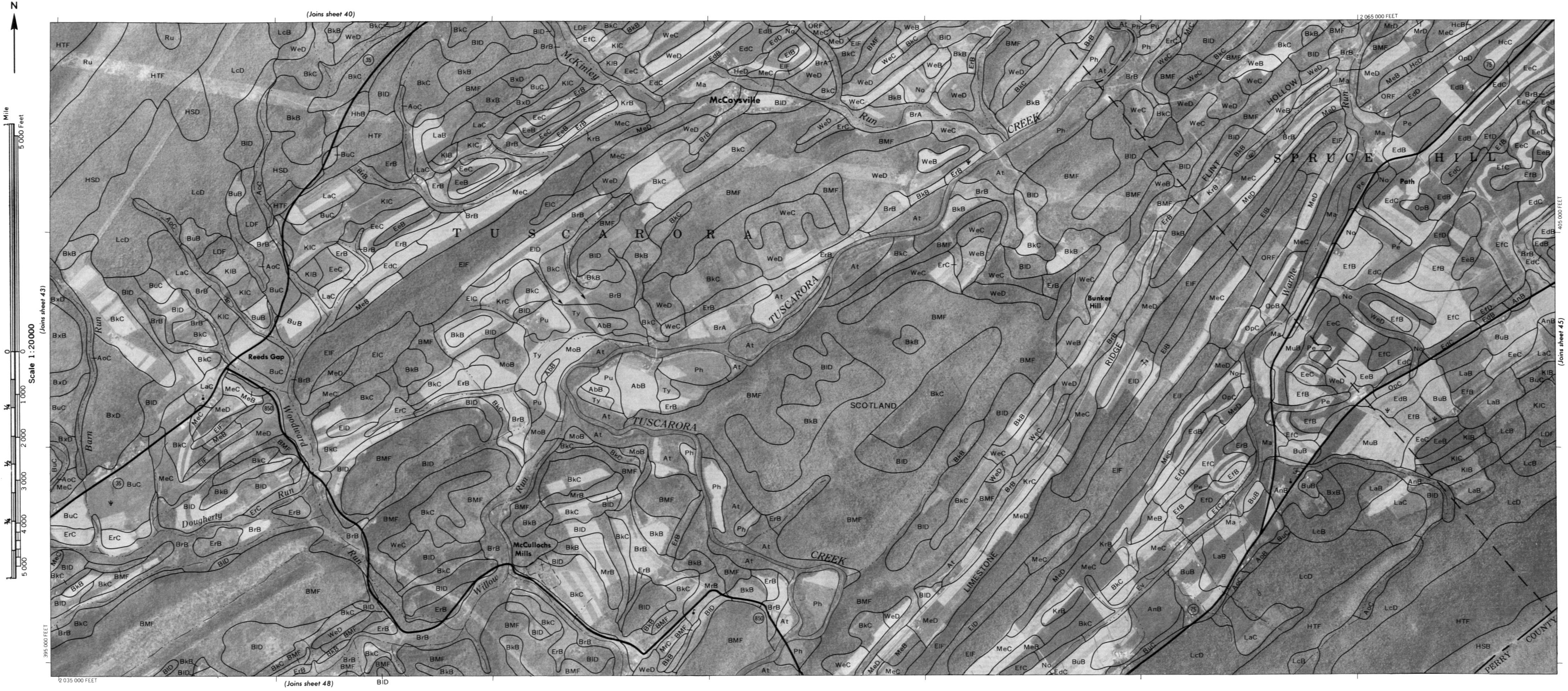
0 1000 2000 3000 4000 5000

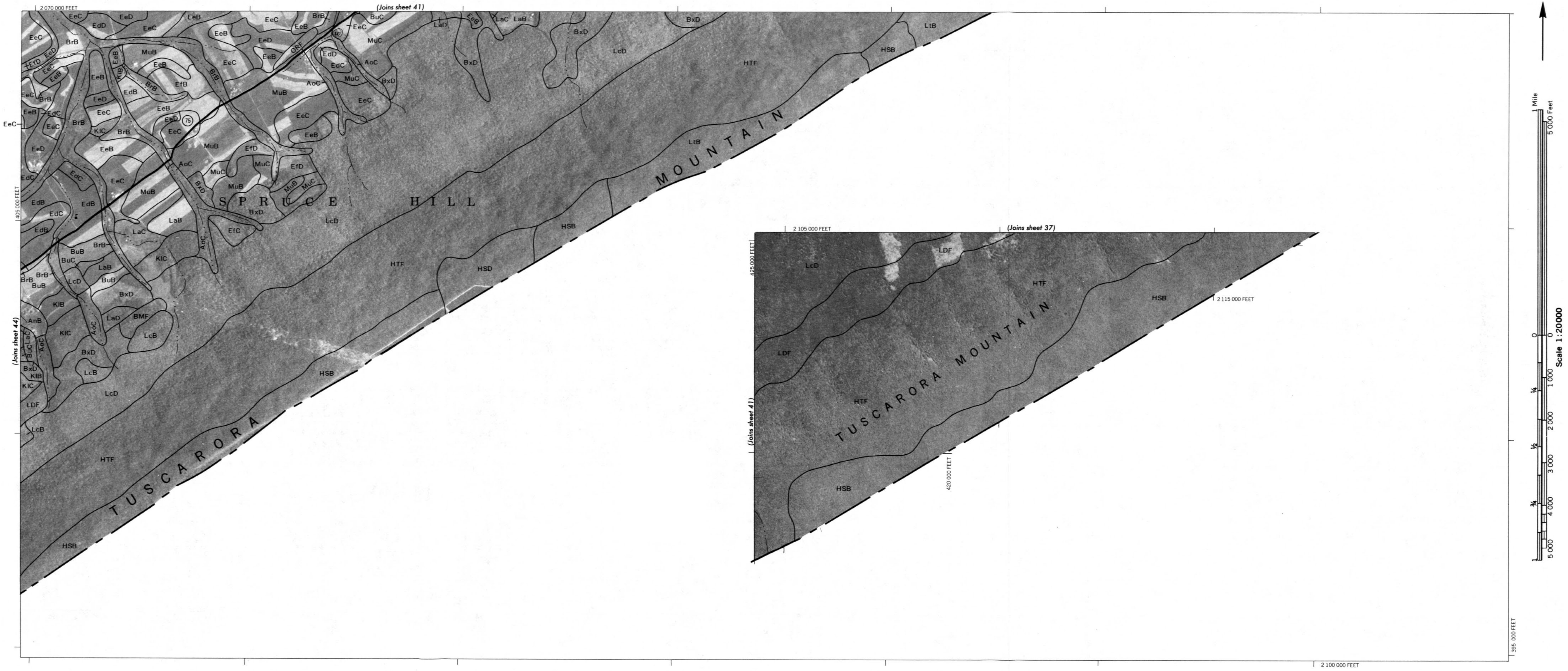
(Joins inset, sheet 33)



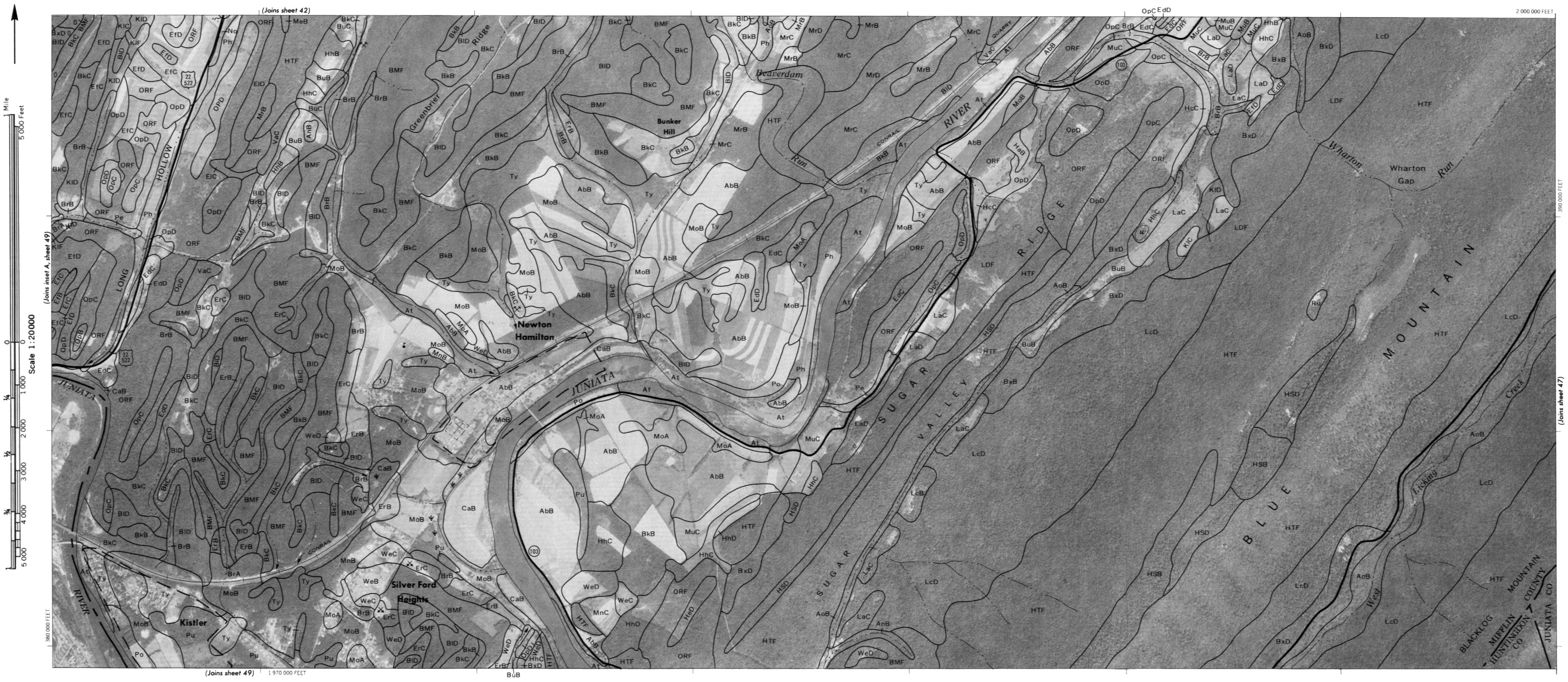

(Joins sheet 39)
(Joins sheet 42)
(Joins sheet 44)
(Joins sheet 47)
2 000 000 FEET
2 030 000 FEET
405 000 FEET
395 000 FEET
JUNIATA RIVER
BRATTON
BLUE MOUNTAIN
BLACKLOG MOUNTAIN
TUSCARORA
SHADE MOUNTAIN
WAYNE
LACK
MIFFLIN COUNTY
JUNIATA COUNTY
Hesser Gap
Miller Gap
Bratton Gap
Reeds Gap
Shanks Run
Bratton Run
East Licking Creek
West Licking Creek
Blacklog Creek
Barn Run
CONRAIL
N
Scale 1:20000
1 Mile
5 000 Feet

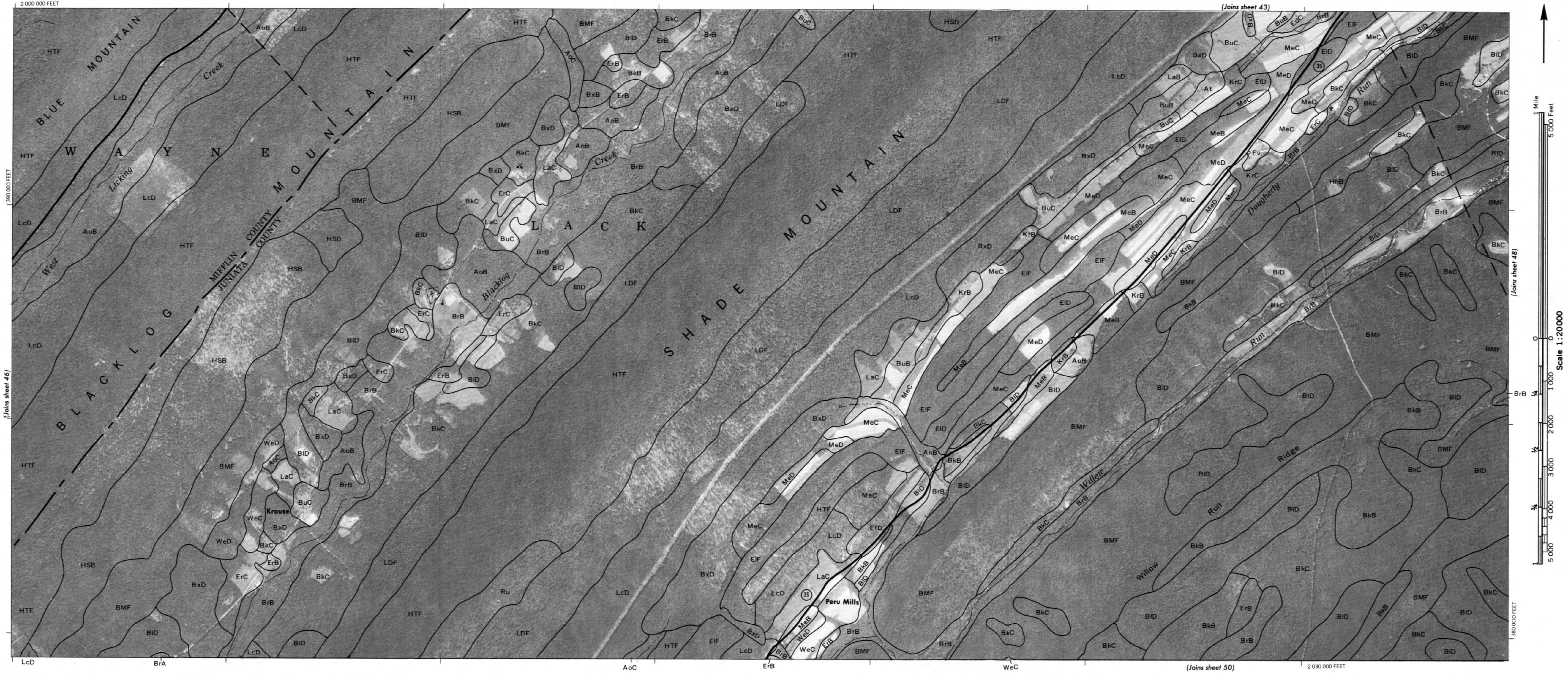
JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 44

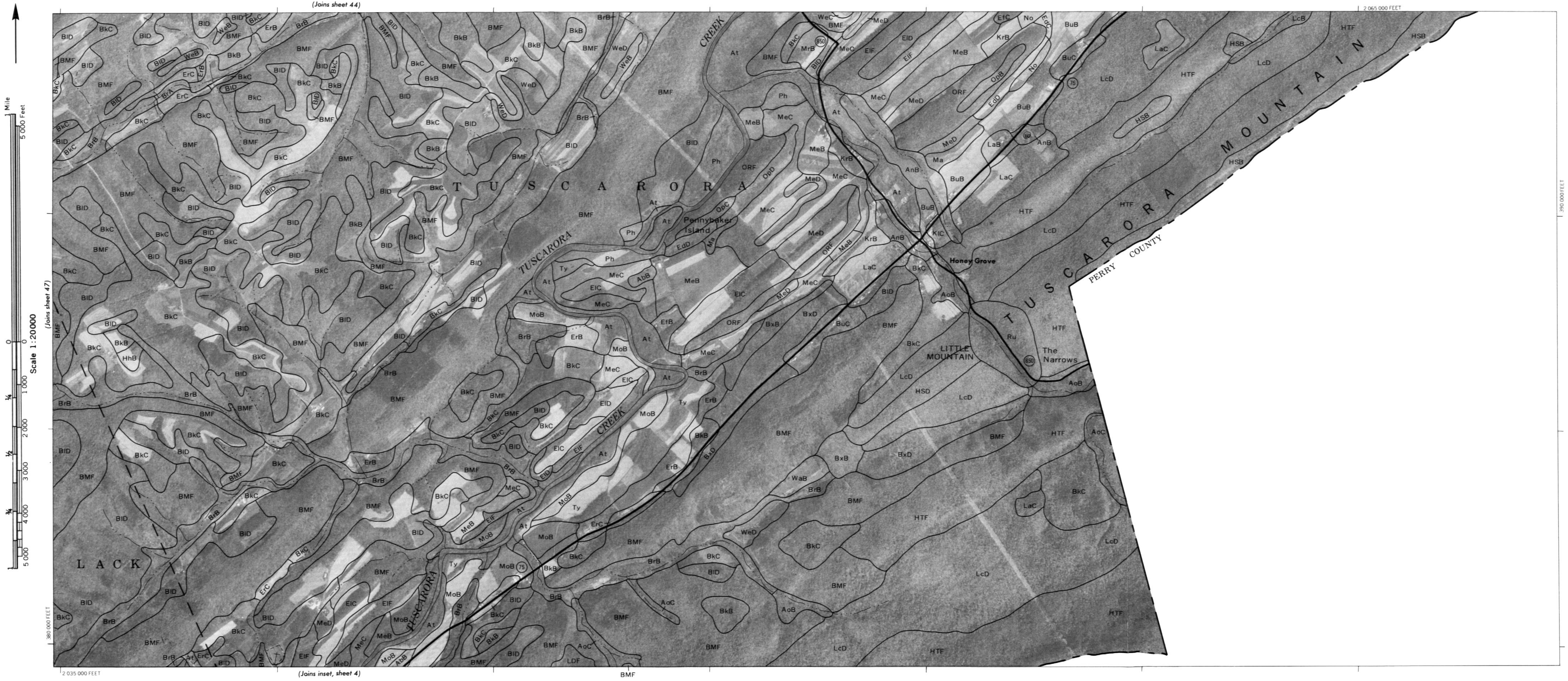


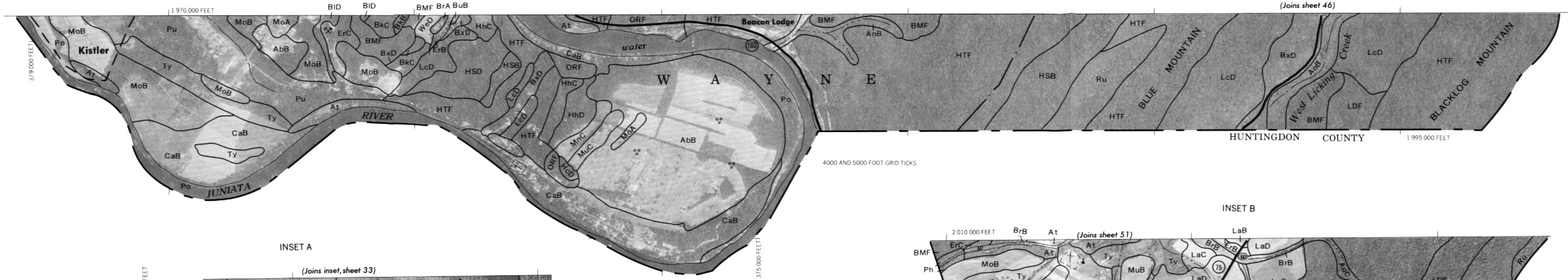

45
N
(Joins sheet 41)
(Joins sheet 44)
(Joins sheet 37)
(Joins sheet 41)
2 070 000 FEET
405 000 FEET
2 105 000 FEET
425 000 FEET
2 115 000 FEET
420 000 FEET
395 000 FEET
2 100 000 FEET
SPRUCE HILL
MOUNTAIN
TUSCARORA
TUSCARORA MOUNTAIN
75
EeC
EeD
EeB
EdD
BrB
BuC
MuC
AoC
MuB
EfB
EdB
EdC
KlB
KlC
LaC
LaB
LaD
LcD
LcB
BxD
HTF
HSB
HSD
LtB
LDF
BMF
BuB
AnB
EfD
EfC
CRF
Mile
5 000 Feet
Scale 1:20000
0
¼
½
¾
1 000
2 000
3 000
4 000
5 000

JUNIATA AND MIFFLIN COUNTIES, PENNSYLVANIA — SHEET NUMBER 46




N
2 000 000 FEET
(Joins sheet 43)
(Joins sheet 46)
(Joins sheet 48)
(Joins sheet 50)
390 000 FEET
380 000 FEET
2 030 000 FEET
BLUE MOUNTAIN
WAYNE MOUNTAIN
BLACKLOG MOUNTAIN
SHADE MOUNTAIN
BLACKLOG
West Licking Creek
Blacklog Creek
Dougherty Run
Willow Run
Willow Run Ridge
MIFFLIN COUNTY
JUNIATA COUNTY
Krause
Peru Mills
35
LcD
BrA
AoC
ErB
WeC
BrB
1 Mile
5 000 Feet
Scale 1:20000

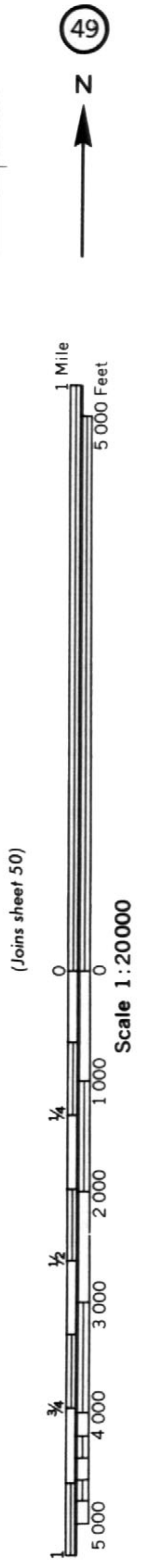

N
(Joins sheet 44)
(Joins sheet 47)
(Joins inset, sheet 4)
2 065 000 FEET
390 000 FEET
380 000 FEET
2 035 000 FEET
1 Mile
5 000 Feet
Scale 1:20000
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
TUSCARORA
TUSCARORA MOUNTAIN
TUSCARORA CREEK
CREEK
LACK
PERRY COUNTY
Pennybaker Island
Honey Grove
LITTLE MOUNTAIN
The Narrows
75
850

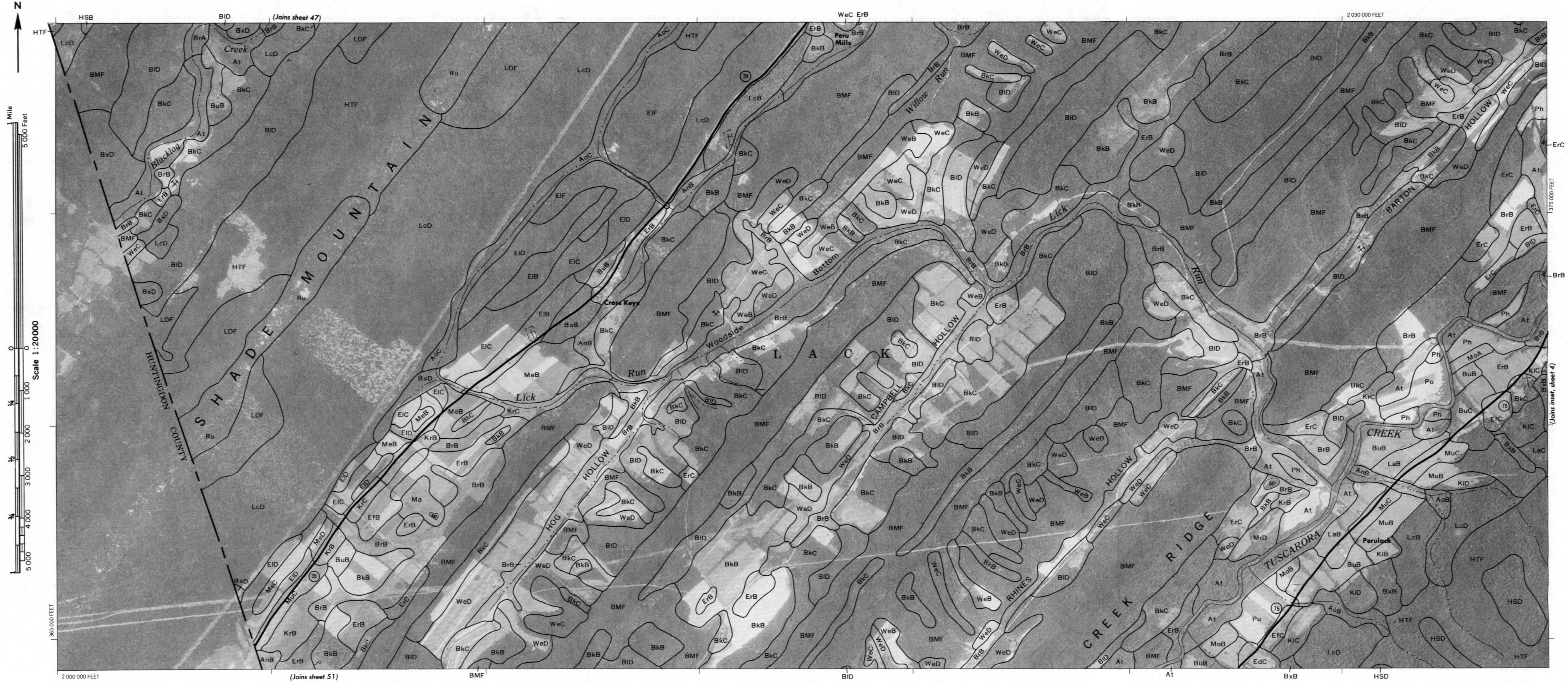


INSET A

4000 AND 5000-FOOT GRID TICKS

INSET B




N
Scale 1:20000
1 Mile
5 000 Feet
(Joins sheet 47)
(Joins sheet 51)
(Joins inset, sheet 4)
2 000 000 FEET
2 030 000 FEET
375 000 FEET
365 000 FEET
SHADE MOUNTAIN
HUNTINGDON COUNTY
Blacklog Creek
Peru Mills
Willow Run
Cross Keys
Woodside Run
Lick Run
Bottom
LACK
CAMPBELL HOLLOW
HOG HOLLOW
RHINES HOLLOW
BARTON HOLLOW
CREEK RIDGE
TUSCARORA CREEK
Perulack
35
75


2 000 000 FEET
350 000 FEET
(Joins sheet 50)
(Joins inset, sheet 4)
(Joins inset B, sheet 49)
2 030 000 FEET
N
CHERRY HOLLOW
George Creek
BLACK CREEK RIDGE
BLAIR HOLLOW
CREEK
TUSCARORA CREEK
TUSCARORA MOUNTAIN
HUNTINGDON COUNTY
PERRY COUNTY
1 Mile
5 000 Feet
Scale 1:20000
0
1 000
2 000
3 000
4 000
5 000